

# Airwell

# Service Manual

## HAD DCI Series

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| Indoor Units  | Outdoor Units |
|---------------|---------------|
| <b>HAD007</b> | GC 7 DCI      |
| <b>HAD009</b> | GC 9 DCI      |
|               | GCD009        |
| <b>HAD012</b> | GC 12 DCI     |
|               | GCD012        |
| <b>HAD018</b> | GC 18 DCI     |
| <b>HAD022</b> | GC 21 DCI     |
| <b>HAD024</b> | GC 24 DCI     |



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**REFRIGERANT**

**R410A**

**HEAT PUMP**

**SM HADDCI 1-A.2 GB**

**MARCH – 2010**

## LIST OF EFFECTIVE PAGES

**Note:** Changes in the pages are indicated by a "Revision#" in the footer of each effected page (when none indicates no changes in the relevant page). All pages in the following list represent effected/ non effected pages divided by chapters.

Dates of issue for original and changed pages are:

Original ..... 0 ..... August 2009

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\*Due to constant improvements please note that the data on this service manual can be modified with out notice.

\*\*Photos are not contractual

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## 1. INTRODUCTION

### 1.1 General

The new **HAD** DC Inverter series is split wall mounted type indoor unit.

It has innovative flat design with background display and range comprise the following RC (heat pump) models:

- **HAD007**
- **HAD018**
- **HAD009**
- **HAD022**
- **HAD012**
- **HAD024**

The indoor **HAD** units are available as LED display types only, featuring esthetic design, compact dimensions, and low noise operation.

### 1.2 Main Features

The **HAD** series benefits from the most advanced innovations, namely:

- Innovative flat panel.
- Background display.
- Networking system connectivity.
- DC Inverter Technology / R410A refrigerant.
- High COP, Energy efficiency class A in cooling mode for all models.
- Advanced display on indoor unit with a backlighted display, displaying the temperature and failure code in technical mode.
- Unique glossy design indoor unit.
- Infrared remote control.
- Indoor large diameter cross flow fan, allowing low operation sound level.
- Bended indoor coil with treated aluminum fins and coating for improved efficiency.
- Cooling operation at outdoor temperature down to -10°C.
- Heating operation at outdoor temperature down to -15°C.
- Automatic treated air sweep.
- Indoor units can be matched to mono and multi splits.
- Easy installation and service.
- Up to 15m pipe length between indoor and outdoor units.
- Up to 10m vertical high between indoor and outdoor units.
- Advanced micro processor control.
- Refrigerant pipe can be connected to the indoor unit from 4 different optional directions.

### 1.3 Indoor Unit

The indoor unit is a wall mounted type, and can be easily fitted to many types of residential and commercial applications.

It includes:

- Casing with air inlet and outlet grills.
- A large-diameter tangential fan.
- Bended coil with treated aluminum fins.
- Motorized flaps.
- Variable Speed motor (PG).
- Advanced electronic control box assembly.
- Interconnecting wiring terminal block.
- Mounting plate.

### 1.4 Filtration

The **HAD** series presents several types of air filters:

- Easily accessible, and re-usable pre-filters (mesh).
- New special filter: Nm photo catalyst + biological anti bacterial.

### 1.5 Control

The microprocessor indoor controller, and an infrared remote control, supplied as standard, provide complete operating function and programming. For further details please refer to the Operation Manual, Appendix A.

### 1.6 Outdoor Unit

The **HAD** outdoor units can be installed as floor or wall mounted units by using a wall supporting bracket. The metal sheets are protected by anti-corrosion paint work allowing long life resistance. All outdoor units are pre-charged. For further information please refer to the Product Data Sheet, Chapter 2.

It includes :

- Compressor mounted in a soundproofed compartment

**Single DC Rotary => for *GC 7 DCI, GC 9 DCI / GCD009, GC 12 DCI / GCD012***

- Axial fan.
- Outdoor coil with hydrophilic louver fins.
- Outlet air fan grill.
- Outdoor advanced controller.
- 2 speed AC motor.
- Service valves "flare" type connection.
- Interconnecting wiring terminal block.

## 1.7 Tubing Connections

Flare type interconnecting tubing to be produced on site.

For further details please refer to the Installation Manual, Outdoor Chapter 9.

## 1.8 Accessories

### RCW Wall Mounted Remote Control


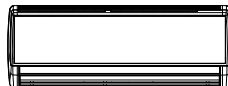
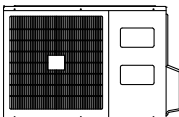
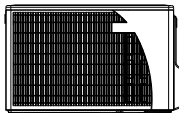
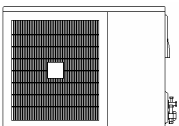
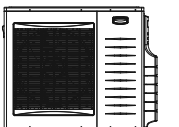
The RCW remote control is mounted on the wall (RC-2), and controls the unit either as an infrared remote control or as a wired controller. The wired controller can control up to 10 Indoor units with the same program settings and adjustments.

For further details please refer to Optional Accessories, Chapter 18.

## 1.9 Inbox Documentation

Each unit is supplied with its own installation and operation manuals one remote control manual.

## 1.10 Matching Table

| OUTDOOR UNITS   |           | REFR” | INDOOR UNITS  |        |        |   |        |        |
|---|-----------|-------|---|--------|--------|---|--------|--------|
| MODEL   |           |       |  |        |        |  |        |        |
|  | GC 7 DCI  | R410A | HAD007  | HAD009 | HAD012 | HAD018  | HAD022 | HAD024 |
|   | GC 9 DCI  |       | ✓   |        |        |   |        |        |
|   | GCD009    |       |   | ✓      |        |   |        |        |
|   | GC 12 DCI |       |   |        | ✓      |   |        |        |
|   | GCD012    |       |   |        | ✓      |   |        |        |
|  | GC 18 DCI |       |   |        |        | ✓   |        |        |
|  | GC 21 DCI |       |   |        |        |   | ✓      |        |
|  | GC 24 DCI |       |   |        |        |   |        | ✓      |

## 2. PRODUCT DATA SHEET

### 2.1 HAD007 / GC 7 WDI DCI

|  |                                     |              |         |                               |                  |
|--|-------------------------------------|--------------|---------|-------------------------------|------------------|
| Model Indoor Unit                            |                                     |              |         | HAD007                        |                  |
| Model Outdoor Unit                           |                                     |              |         | GC 7 WDI DCI                  |                  |
| Installation Method of Pipe                  |                                     |              |         | Flared                        |                  |
| Characteristics                              |                                     |              | Units   | Cooling                       | Heating          |
| Capacity <sup>(1)</sup>                      |                                     |              | Btu/hr  | 7500(4440-9200)               | 7500(5110-11250) |
|  |                                     |              | kW      | 2.2(1.3-2.7)                  | 2.2(1.5-3.3)     |
| Power input <sup>(1)</sup>                   |                                     |              | kW      | 0.65                          | 0.61             |
| EER (Cooling) or COP(Heating) <sup>(1)</sup> |                                     |              | W/W     | 3.40                          | 3.61             |
| Energy efficiency class                      |                                     |              |         | A                             | A                |
| Power supply                                 |                                     |              | V/Ph/Hz | 220-240 / 1 / 50              |                  |
| Rated current                                |                                     |              | A       | 3.0                           | 3.3              |
| Starting current                             |                                     |              | A       | 10.5                          |                  |
| Circuit breaker rating                       |                                     |              | A       | 10                            |                  |
| INDOOR                                       | Fan type & quantity                 |              |         | Crossflow x 1                 |                  |
|  | Fan speeds                          | H/M/L        | RPM     | 1100/950/800                  |                  |
|  | Air flow <sup>(2)</sup>             | H/M/L        | m3/hr   | 400/350/300                   |                  |
|  | External static pressure            | Min-Max      | Pa      | 0                             |                  |
|  | Sound power level <sup>(3)</sup>    | H/M/L        | dB(A)   | 49/46/43                      |                  |
|  | Sound pressure level <sup>(4)</sup> | H/M/L        | dB(A)   | 36/32/27                      |                  |
|  | Moisture removal                    |              | l/hr    | 0.9                           |                  |
|  | Condensate drain tube I.D           |              | mm      | 16                            |                  |
|  | Dimensions                          | WxHxD        | mm      | 680 x250 X188                 |                  |
|  | Weight                              |              | kg      | 7                             |                  |
|  | Package dimensions                  | WxHxD        | mm      | 740x320x265                   |                  |
|  | Packaged weight                     |              | kg      | 10                            |                  |
|  | Units per pallet                    |              | units   | 36 units per pallet           |                  |
|  | Stacking height                     |              | units   | 9 levels                      |                  |
| OUTDOOR                                      | Refrigerant control                 |              |         | EEV                           |                  |
|  | Compressor type,model               |              |         | Rotary, Panasonic 5RS092XDJ01 |                  |
|  | Fan type & quantity                 |              |         | Propeller(direct) x 1         |                  |
|  | Fan speeds                          | H/L          | RPM     | 770                           |                  |
|  | Air flow                            | H/L          | m3/hr   | 1400                          |                  |
|  | Sound power level                   | H/L          | dB(A)   | 64                            |                  |
|  | Sound pressure level <sup>(4)</sup> | H/L          | dB(A)   | 54                            |                  |
|  | Dimensions                          | WxHxD        | mm      | 760x245x545                   |                  |
|  | Weight                              |              | kg      | 35                            |                  |
|  | Package dimensions                  | WxHxD        | mm      | 880x310x610                   |                  |
|  | Packaged weight                     |              | kg      | 38                            |                  |
|  | Units per pallet                    |              | Units   | 12 units per pallet           |                  |
|  | Stacking height                     |              | units   | 3 levels                      |                  |
|  | Refrigerant type                    |              |         | R410A                         |                  |
|  | Refrigerant chargless distance      |              | kg/m    | 0.7kg/7.5m                    |                  |
|  | Additional charge per 1 meter       |              | g/m     | No need                       |                  |
|  | Connections between units           | Liquid line  | In.(mm) | 1/4"(6.35)                    |                  |
|  |                                     | Suction line | In.(mm) | 3/8"(9.53)                    |                  |
| Max.tubing length                            |                                     | m.           | Max.15  |                               |                  |
| Max.height difference                        |                                     | m.           | Max.10  |                               |                  |
| Operation control type                       |                                     |              |         | Remote control                |                  |
| Heating elements                             |                                     |              | kW      |                               |                  |
| Others                                       |                                     |              |         |                               |                  |

(1) Rating conditions in accordance with ISO 5151 and ISO 13253 (for ducted units) and EN 14511.

(2) Airflow in ducted units; at nominal external static pressure.

(3) Sound power in ducted units is measured at air discharge.

(4) Sound pressure level measured at 1 meter distance from unit.

## 2.2 HAD009 / GC 9 WDI DCI

|  |                                     |         |              |                               |                  |  |
|--|-------------------------------------|---------|--------------|-------------------------------|------------------|--|
| Model Indoor Unit                            |                                     |         |              | HAD009                        |                  |  |
| Model Outdoor Unit                           |                                     |         |              | GC 9 WDI DCI                  |                  |  |
| Installation Method of Pipe                  |                                     |         |              | Flared                        |                  |  |
| Characteristics                              |                                     |         | Units        | Cooling                       | Heating          |  |
| Capacity <sup>(1)</sup>                      |                                     |         | Btu/hr       | 8530(4440-10240)              | 8530(4432-11270) |  |
|  |                                     |         | kW           | 2.5(1.1-3.1)                  | 2.5(1.3-3.6)     |  |
| Power input <sup>(1)</sup>                   |                                     |         | kW           | 0.73                          | 0.69             |  |
| EER (Cooling) or COP(Heating) <sup>(1)</sup> |                                     |         | W/W          | 3.41                          | 3.61             |  |
| Energy efficiency class                      |                                     |         |              | A                             | A                |  |
| Power supply                                 |                                     |         | V/Ph/Hz      | 220-240 / 1 / 50              |                  |  |
| Rated current                                |                                     |         | A            | 3.2                           | 3.1              |  |
| Starting current                             |                                     |         | A            | 10.5                          |                  |  |
| Circuit breaker rating                       |                                     |         | A            | 10                            |                  |  |
| INDOOR                                       | Fan type & quantity                 |         |              | Crossflow x 1                 |                  |  |
|  | Fan speeds                          | H/M/L   | RPM          | 1150/950/800                  |                  |  |
|  | Air flow <sup>(2)</sup>             | H/M/L   | m3/hr        | 420/350/270                   |                  |  |
|  | External static pressure            | Min-Max | Pa           | 0                             |                  |  |
|  | Sound power level <sup>(3)</sup>    | H/M/L   | dB(A)        | 52/48/45                      |                  |  |
|  | Sound pressure level <sup>(4)</sup> | H/M/L   | dB(A)        | 39/35/29                      |                  |  |
|  | Moisture removal                    |         | l/hr         | 1                             |                  |  |
|  | Condensate drain tube I.D           |         | mm           | 16                            |                  |  |
|  | Dimensions                          | WxHxD   | mm           | 680 x250 X188                 |                  |  |
|  | Weight                              |         | kg           | 7                             |                  |  |
|  | Package dimensions                  | WxHxD   | mm           | 740x320x265                   |                  |  |
|  | Packaged weight                     |         | kg           | 10                            |                  |  |
|  | Units per pallet                    |         | units        | 36 units per pallet           |                  |  |
|  | Stacking height                     |         | units        | 9 levels                      |                  |  |
| OUTDOOR                                      | Refrigerant control                 |         |              | EEV                           |                  |  |
|  | Compressor type,model               |         |              | Rotary, Panasonic 5RS092XDJ01 |                  |  |
|  | Fan type & quantity                 |         |              | Propeller(direct) x 1         |                  |  |
|  | Fan speeds                          | H/L     | RPM          | 760                           |                  |  |
|  | Air flow                            | H/L     | m3/hr        | 1390                          |                  |  |
|  | Sound power level                   | H/L     | dB(A)        | 64                            |                  |  |
|  | Sound pressure level <sup>(4)</sup> | H/L     | dB(A)        | 54                            |                  |  |
|  | Dimensions                          | WxHxD   | mm           | 760x245x545                   |                  |  |
|  | Weight                              |         | kg           | 36                            |                  |  |
|  | Package dimensions                  | WxHxD   | mm           | 880x310x610                   |                  |  |
|  | Packaged weight                     |         | kg           | 39                            |                  |  |
|  | Units per pallet                    |         | Units        | 12 units per pallet           |                  |  |
|  | Stacking height                     |         | units        | 3 levels                      |                  |  |
|  | Refrigerant type                    |         |              | R410A                         |                  |  |
|  | Refrigerant chargless distance      |         | kg/m         | 0.85kg/7.5m                   |                  |  |
|  | Additional charge per 1 meter       |         | g/m          | No need                       |                  |  |
|  | Connections between units           |         | Liquid line  | ln.(mm)                       | 1/4"(6.35)       |  |
|  |                                     |         | Suction line | ln.(mm)                       | 3/8"(9.53)       |  |
| Max.tubing length                            |                                     |         | m.           | Max.15                        |                  |  |
| Max.height difference                        |                                     |         | m.           | Max.10                        |                  |  |
| Operation control type                       |                                     |         |              | Remote control                |                  |  |
| Heating elements                             |                                     |         | kW           |                               |                  |  |
| Others                                       |                                     |         |              |                               |                  |  |

(1) Rating conditions in accordance with ISO 5151 and ISO 13253 (for ducted units) and EN 14511.

(2) Airflow in ducted units; at nominal external static pressure.

(3) Sound power in ducted units is measured at air discharge.

(4) Sound pressure level measured at 1 meter distance from unit.



## 2.3 HAD009 / GCD009 DCI

| Model Indoor Unit                            |                                     |       |                       | HAD009 DCI                     |                  |  |
|--|-------------------------------------|-------|-----------------------|--------------------------------|------------------|--|
| Model Outdoor Unit                           |                                     |       |                       | GCD 009 R410A                  |                  |  |
| Installation Method of Pipe                  |                                     |       |                       | Flared                         |                  |  |
| Characteristics                              |                                     |       | Units                 | Cooling                        | Heating          |  |
| Capacity <sup>(4)</sup>                      |                                     |       | Btu/hr                | 8530(2730-10240)               | 8530(3410-10920) |  |
|  |                                     |       | kW                    | 2.5(0.8-3.0)                   | 2.5(1.0-3.2)     |  |
| Power input <sup>(4)</sup>                   |                                     |       | kW                    | 0.78(0.30-1.00)                | 0.69(0.37-0.90)  |  |
| EER (Cooling) or COP(Heating) <sup>(4)</sup> |                                     |       | W/W                   | 3.21                           | 3.61             |  |
| Energy efficiency class                      |                                     |       |                       | A                              | A                |  |
| Power supply                                 |                                     |       | V                     | 220-240                        |                  |  |
|  |                                     |       | Ph                    | 1                              |                  |  |
|  |                                     |       | Hz                    | 50                             |                  |  |
| Rated current                                |                                     |       | A                     | 3.5                            | 3.1              |  |
| Power factor                                 |                                     |       |                       | 0.97                           | 0.97             |  |
| Prated (IDU)                                 |                                     |       | W                     | 25                             |                  |  |
| Prated (IDU+ODU)                             |                                     |       | W                     | 1400                           |                  |  |
| Starting current                             |                                     |       | A                     | 10.5                           |                  |  |
| Circuit breaker rating                       |                                     |       | A                     | 10                             |                  |  |
| INDOOR                                       | Fan type & quantity                 |       |                       | Crossflow x 1                  |                  |  |
|  | Fan speeds                          | H/M/L | RPM                   | 1150/1000/800                  |                  |  |
|  | Air flow <sup>(1)</sup>             | H/M/L | m3/hr                 | 420/350/270                    |                  |  |
|  | External static pressure            | Min   | Pa                    | 0                              |                  |  |
|  | Sound power level <sup>(2)</sup>    | H/M/L | dB(A)                 | 54                             |                  |  |
|  | Sound pressure level <sup>(3)</sup> | H/M/L | dB(A)                 | 40/35/29                       |                  |  |
|  | Moisture removal                    |       | l/hr                  | 1.0                            |                  |  |
|  | Condensate drain tube I.D           |       | mm                    | 16                             |                  |  |
|  | Dimensions                          | WxHxD | mm                    | 680 x250 X188                  |                  |  |
|  | Net Weight                          |       | kg                    | 7                              |                  |  |
|  | Package dimensions                  | WxHxD | mm                    | 740x310x248                    |                  |  |
|  | Packaged weight                     |       | kg                    | 10                             |                  |  |
|  | Units per pallet                    |       | units                 | 32                             |                  |  |
|  | Stacking height                     |       | units                 | 8                              |                  |  |
| OUTDOOR                                      | Refrigerant control                 |       |                       | Capillary                      |                  |  |
|  | Compressor type,model               |       |                       | Rotary, Toshiba, DA89X1C-20FZ3 |                  |  |
|  | Fan type & quantity                 |       |                       | Propeller(direct) x 1          |                  |  |
|  | Fan speeds                          | H     | RPM                   | 830                            |                  |  |
|  | Air flow                            | H     | m3/hr                 | 1460                           |                  |  |
|  | Sound power level                   | H     | dB(A)                 | 65                             |                  |  |
|  | Sound pressure level <sup>(3)</sup> | H     | dB(A)                 | 55                             |                  |  |
|  | Dimensions                          | WxHxD | mm                    | 760x545x245                    |                  |  |
|  | Net Weight                          |       | kg                    | 31                             |                  |  |
|  | Package dimensions                  | WxHxD | mm                    | 880x610x310                    |                  |  |
|  | Packaged weight                     |       | kg                    | 33                             |                  |  |
|  | Units per pallet                    |       | Units                 | 12 units per pallet            |                  |  |
|  | Stacking height                     |       | units                 | 3 levels                       |                  |  |
|  | Refrigerant type                    |       |                       | R410A                          |                  |  |
|  | Scharg                              |       | kg(7.5m)              | 0.7                            |                  |  |
|  | Additional charge                   |       |                       | L≤10m:+0g      10L ≤15m:+200g  |                  |  |
|  | Connections between units           |       | Liquid line           | In.(mm)                        | 1/4"(6.35)       |  |
|  |                                     |       | Suction line          | In.(mm)                        | 3/8"(9.53)       |  |
|  |                                     |       | Max.tubing length     | m.                             | Max. 15          |  |
|  |                                     |       | Max.height difference | m.                             | Max. 10          |  |
| Operation control type                       |                                     |       |                       | Remote control                 |                  |  |
| Heating elements (Option)                    |                                     |       | kW                    |                                |                  |  |
| Others                                       |                                     |       |                       |                                |                  |  |

(1) Rating conditions in accordance with ISO 5151 and ISO 13253 (for ducted units) and EN 14511.

(2) Airflow in ducted units; at nominal external static pressure.

(3) Sound power in ducted units is measured at air discharge.

(4) Sound pressure level measured at 1 meter distance from unit.

## 2.4 HAD012 / GC 12 WDI DCI

|  |                                     |                   |         |                             |                    |
|--|-------------------------------------|-------------------|---------|-----------------------------|--------------------|
| Model Indoor Unit                            |                                     |                   |         | HAD012                      |                    |
| Model Outdoor Unit                           |                                     |                   |         | GC 12 WDI DCI               |                    |
| Installation Method of Pipe                  |                                     |                   |         | Flared                      |                    |
| Characteristics                              |                                     |                   | Units   | Cooling                     | Heating            |
| Capacity <sup>(1)</sup>                      |                                     |                   | Btu/hr  | 11940(4440-13990)           | 11940 (5800-13990) |
|  |                                     |                   | kW      | 3.5(1.3-4.1)                | 3.6(1.7-4.1)       |
| Power input <sup>(1)</sup>                   |                                     |                   | kW      | 1.0                         | 0.97               |
| EER (Cooling) or COP(Heating) <sup>(1)</sup> |                                     |                   | W/W     | 3.5                         | 3.61               |
| Energy efficiency class                      |                                     |                   |         | A                           | A                  |
| Power supply                                 |                                     |                   | V/Ph/Hz | 220-240 / 1 / 50            |                    |
| Rated current                                |                                     |                   | A       | 4.6                         | 4.3                |
| Starting current                             |                                     |                   | A       | 10.5                        |                    |
| Circuit breaker rating                       |                                     |                   | A       | 15                          |                    |
| INDOOR                                       | Fan type & quantity                 |                   |         | Crossflow x 1               |                    |
|  | Fan speeds                          | H/M/L             | RPM     | 1150/950/750                |                    |
|  | Air flow <sup>(2)</sup>             | H/M/L             | m3/hr   | 550/450/350                 |                    |
|  | External static pressure            | Min-Max           | Pa      | 0                           |                    |
|  | Sound power level <sup>(3)</sup>    | H/M/L             | dB(A)   | 52/46/42                    |                    |
|  | Sound pressure level <sup>(4)</sup> | H/M/L             | dB(A)   | 40/34/28                    |                    |
|  | Moisture removal                    |                   | l/hr    | 1.5                         |                    |
|  | Condensate drain tube I.D           |                   | mm      | 16                          |                    |
|  | Dimensions                          | WxHxD             | mm      | 840x250x188                 |                    |
|  | Weight                              |                   | kg      | 8                           |                    |
|  | Package dimensions                  | WxHxD             | mm      | 930x320x265                 |                    |
|  | Packaged weight                     |                   | kg      | 11                          |                    |
|  | Units per pallet                    |                   | units   | 36 units per pallet         |                    |
|  | Stacking height                     |                   | units   | 9 levels                    |                    |
| OUTDOOR                                      | Refrigerant control                 |                   |         | EEV                         |                    |
|  | Compressor type,model               |                   |         | Rotary, Panasonic 5RS102XAB |                    |
|  | Fan type & quantity                 |                   |         | Propeller(direct) x 1       |                    |
|  | Fan speeds                          | H/L               | RPM     | 830                         |                    |
|  | Air flow                            | H/L               | m3/hr   | 1460                        |                    |
|  | Sound power level                   | H/L               | dB(A)   | 65                          |                    |
|  | Sound pressure level <sup>(4)</sup> | H/L               | dB(A)   | 55                          |                    |
|  | Dimensions                          | WxHxD             | mm      | 760x245x545                 |                    |
|  | Weight                              |                   | kg      | 37                          |                    |
|  | Package dimensions                  | WxHxD             | mm      | 880x310x610                 |                    |
|  | Packaged weight                     |                   | kg      | 40                          |                    |
|  | Units per pallet                    |                   | Units   | 12 units per pallet         |                    |
|  | Stacking height                     |                   | units   | 3 levels                    |                    |
|  | Refrigerant type                    |                   |         | R410A                       |                    |
|  | Refrigerant chargeless distance     |                   | kg/m    | 1.0kg/7.5m                  |                    |
|  | Additional charge per 1 meter       |                   | g/m     | No need                     |                    |
|  | Connections between units           | Liquid line       | In.(mm) | 1/4"(6.35)                  |                    |
|  |                                     | Suction line      | In.(mm) | 3/8"(9.53)                  |                    |
|  |                                     | Max.tubing length | m.      | Max.15                      |                    |
| Max.height difference                        |                                     | m.                | Max.10  |                             |                    |
| Operation control type                       |                                     |                   |         | Remote control              |                    |
| Heating elements                             |                                     |                   | kW      | No                          |                    |
| Others                                       |                                     |                   |         |                             |                    |

(1) Rating conditions in accordance with ISO 5151 and ISO 13253 (for ducted units) and EN 14511.

(2) Airflow in ducted units; at nominal external static pressure.

(3) Sound power in ducted units is measured at air discharge.

(4) Sound pressure level measured at 1 meter distance from unit.

## 2.5 HAD012 / GCD012

| Model Indoor Unit                            |                                     |                       |                                 | HAD012 DCI        |                   |  |
|--|-------------------------------------|-----------------------|---------------------------------|-------------------|-------------------|--|
| Model Outdoor Unit                           |                                     |                       |                                 | GCD 012 R410A     |                   |  |
| Installation Method of Pipe                  |                                     |                       |                                 | Flared            |                   |  |
| Characteristics                              |                                     |                       | Units                           | Cooling           | Heating           |  |
| Capacity <sup>(4)</sup>                      |                                     |                       | Btu/hr                          | 11940(3070-13650) | 11940(4090-14330) |  |
|  |                                     |                       | kW                              | 3.5(0.90-4.0)     | 3.5(1.2-4.2)      |  |
| Power input <sup>(4)</sup>                   |                                     |                       | kW                              | 1.09(0.33-1.50)   | 0.97(0.45-1.30)   |  |
| EER (Cooling) or COP(Heating) <sup>(4)</sup> |                                     |                       | W/W                             | 3.21              | 3.61              |  |
| Energy efficiency class                      |                                     |                       |                                 | A                 | A                 |  |
| Power supply                                 |                                     |                       | V                               | 220-240           |                   |  |
|  |                                     |                       | Ph                              | 1                 |                   |  |
|  |                                     |                       | Hz                              | 50                |                   |  |
| Rated current                                |                                     |                       | A                               | 4.9               | 4.3               |  |
| Power factor                                 |                                     |                       |                                 | 0.97              | 0.97              |  |
| Prated (IDU)                                 |                                     |                       | W                               | 30                |                   |  |
| Prated (IDU+ODU)                             |                                     |                       | W                               | 1500              |                   |  |
| Starting current                             |                                     |                       | A                               | 10.5              |                   |  |
| Circuit breaker rating                       |                                     |                       | A                               | 15                |                   |  |
| INDOOR                                       | Fan type & quantity                 |                       |                                 | Crossflow x 1     |                   |  |
|  | Fan speeds                          | H/M/L                 | RPM                             | 1150/950/750      |                   |  |
|  | Air flow <sup>(1)</sup>             | H/M/L                 | m3/hr                           | 550/450/350       |                   |  |
|  | External static pressure            | Min                   | Pa                              | 0                 |                   |  |
|  | Sound power level <sup>(2)</sup>    | H/M/L                 | dB(A)                           | 56                |                   |  |
|  | Sound pressure level <sup>(3)</sup> | H/M/L                 | dB(A)                           | 40/34/28          |                   |  |
|  | Moisture removal                    |                       | l/hr                            | 1.5               |                   |  |
|  | Condensate drain tube I.D           |                       | mm                              | 16                |                   |  |
|  | Dimensions                          | WxHxD                 | mm                              | 840x250x188       |                   |  |
|  | Net Weight                          |                       | kg                              | 8                 |                   |  |
|  | Package dimensions                  | WxHxD                 | mm                              | 900x310x248       |                   |  |
|  | Packaged weight                     |                       | kg                              | 11                |                   |  |
|  | Units per pallet                    |                       | units                           | 32                |                   |  |
|  | Stacking height                     |                       | units                           | 8                 |                   |  |
|  | OUTDOOR                             | Refrigerant control   |                                 |                   | Capillary         |  |
| Compressor type,model                        |                                     |                       | Rotary, Toshiba, DA108X1C-20FZ3 |                   |                   |  |
| Fan type & quantity                          |                                     |                       | Propeller(direct) x 1           |                   |                   |  |
| Fan speeds                                   |                                     | H                     | RPM                             | 830               |                   |  |
| Air flow                                     |                                     | H                     | m3/hr                           | 1460              |                   |  |
| Sound power level                            |                                     | H                     | dB(A)                           | 66                |                   |  |
| Sound pressure level <sup>(3)</sup>          |                                     | H                     | dB(A)                           | 56                |                   |  |
| Dimensions                                   |                                     | WxHxD                 | mm                              | 760x545x245       |                   |  |
| Net Weight                                   |                                     | kg                    | 32                              |                   |                   |  |
| Package dimensions                           |                                     | WxHxD                 | mm                              | 880x610x310       |                   |  |
| Packaged weight                              |                                     | kg                    | 34                              |                   |                   |  |
| Units per pallet                             |                                     | Units                 | 12 units per pallet             |                   |                   |  |
| Stacking height                              |                                     | units                 | 3 levels                        |                   |                   |  |
| Refrigerant type                             |                                     |                       | R410A                           |                   |                   |  |
| Scharg                                       |                                     | kg(7.5m)              | 0.95                            |                   |                   |  |
| Additional charge                            |                                     |                       | L≤10m:+0g      10L ≤15m:+200g   |                   |                   |  |
| Connections between units                    |                                     | Liquid line           | In.(mm)                         | 1/4"(6.35)        |                   |  |
|  |                                     | Suction line          | In.(mm)                         | 3/8"(9.53)        |                   |  |
|  |                                     | Max.tubing length     | m.                              | Max. 15           |                   |  |
|  |                                     | Max.height difference | m.                              | Max. 10           |                   |  |
| Operation control type                       |                                     |                       |                                 | Remote control    |                   |  |
| Heating elements (Option)                    |                                     |                       | kW                              | No                |                   |  |
| Others                                       |                                     |                       |                                 |                   |                   |  |

(1) Rating conditions in accordance with ISO 5151 and ISO 13253 (for ducted units) and EN 14511.

(2) Airflow in ducted units; at nominal external static pressure.

(3) Sound power in ducted units is measured at air discharge.

(4) Sound pressure level measured at 1 meter distance from unit.

## 2.6 HAD018 / GC 18 DCI

|  |                                     |                   |          |                              |                   |
|--|-------------------------------------|-------------------|----------|------------------------------|-------------------|
| Model Indoor Unit                            |                                     |                   |          | HAD018 DCI                   |                   |
| Model Outdoor Unit                           |                                     |                   |          | GC 18 R410A                  |                   |
| Installation Method of Pipe                  |                                     |                   |          | Flared                       |                   |
| Characteristics                              |                                     |                   | Units    | Cooling                      | Heating           |
| Capacity <sup>(4)</sup>                      |                                     |                   | Btu/hr   | 17060(5120-20470)            | 20470(5120-25930) |
|  |                                     |                   | kW       | 5.00(1.50-6.00)              | 6.00(1.50-7.60)   |
| Power input <sup>(4)</sup>                   |                                     |                   | kW       | 1.46(0.50-2.00)              | 1.66(0.45-2.20)   |
| EER (Cooling) or COP(Heating) <sup>(4)</sup> |                                     |                   | W/W      | 3.42                         | 3.61              |
| Energy efficiency class                      |                                     |                   |          | A                            | A                 |
| Power supply                                 |                                     |                   | V        | 220-240                      |                   |
|  |                                     |                   | Ph       | Single                       |                   |
|  |                                     |                   | Hz       | 50                           |                   |
| Rated current                                |                                     |                   | A        | 6.5                          | 7.4               |
| Power factor                                 |                                     |                   |          | 0.97                         | 0.97              |
| Prated (IDU)                                 |                                     |                   | W        | 56                           |                   |
| Prated (IDU+ODU)                             |                                     |                   | W        | 2200                         |                   |
| Starting current                             |                                     |                   | A        | 10.5                         |                   |
| Circuit breaker rating                       |                                     |                   | A        | 20                           |                   |
| INDOOR                                       | Fan type & quantity                 |                   |          | Crossflow x 1                |                   |
|  | Fan speeds                          | H/M/L             | RPM      | 1200/1050/900                |                   |
|  | Air flow <sup>(1)</sup>             | H/M/L             | m3/hr    | 850/700/550                  |                   |
|  | External static pressure            | Min               | Pa       | 0                            |                   |
|  | Sound power level <sup>(2)</sup>    | H/M/L             | dB(A)    | 58/54/50                     |                   |
|  | Sound pressure level <sup>(3)</sup> | H/M/L             | dB(A)    | 44/39/34                     |                   |
|  | Moisture removal                    |                   | l/hr     | 2                            |                   |
|  | Condensate drain tube I.D           |                   | mm       | 16                           |                   |
|  | Dimensions                          | WxHxD             | mm       | 1060x295x221                 |                   |
|  | Net Weight                          |                   | kg       | 15                           |                   |
|  | Package dimensions                  | WxHxD             | mm       | 1125x360x295                 |                   |
|  | Packaged weight                     |                   | kg       | 18                           |                   |
|  | Units per pallet                    |                   | units    | 16                           |                   |
|  | Stacking height                     |                   | units    | 8 levels                     |                   |
| OUTDOOR                                      | Refrigerant control                 |                   |          | EEV                          |                   |
|  | Compressor type,model               |                   |          | Scroll,Panasonic 5CS130XCC03 |                   |
|  | Fan type & quantity                 |                   |          | Propeller(direct) x 1        |                   |
|  | Fan speeds                          | H                 | RPM      | 920                          |                   |
|  | Air flow                            | H                 | m³/hr    | 2160                         |                   |
|  | Sound power level                   | H                 | dB(A)    | 63                           |                   |
|  | Sound pressure level <sup>(3)</sup> | H                 | dB(A)    | 53                           |                   |
|  | Dimensions                          | WxHxD             | mm       | 795x610x290                  |                   |
|  | Net Weight                          |                   | kg       | 39                           |                   |
|  | Package dimensions                  | WxHxD             | mm       | 945x655x395                  |                   |
|  | Packaged weight                     |                   | kg       | 43                           |                   |
|  | Units per pallet                    |                   | Units    | 9                            |                   |
|  | Stacking height                     |                   | units    | 3 levels                     |                   |
|  | Refrigerant type                    |                   |          | R410A                        |                   |
|  | Standard charge                     |                   | kg(7.5m) | 1.50kg                       |                   |
|  | Additional charge                   |                   |          | No need                      |                   |
|  | Connections between units           | Liquid line       | In.(mm)  | 1/4"(6.35)                   |                   |
|  |                                     | Suction line      | In.(mm)  | 1/2"(12.7)                   |                   |
|  |                                     | Max.tubing length | m.       | 30                           |                   |
| Max.height difference                        |                                     | m.                | 10       |                              |                   |
| Operation control type                       |                                     |                   |          | Remote control               |                   |
| Heating elements (Option)                    |                                     |                   | kW       |                              |                   |
| Others                                       |                                     |                   |          |                              |                   |

(1) Rating conditions in accordance with ISO 5151 and ISO 13253 (for ducted units) and EN 14511.

(2) Airflow in ducted units; at nominal external static pressure.

(3) Sound power in ducted units is measured at air discharge.

(4) Sound pressure level measured at 1 meter distance from unit.

## 2.7 HAD022 / GC 21

|  |                                     |              |          |                              |                   |
|--|-------------------------------------|--------------|----------|------------------------------|-------------------|
| Model Indoor Unit                            |                                     |              |          | HAD022 DCI                   |                   |
| Model Outdoor Unit                           |                                     |              |          | GC 21 R410A                  |                   |
| Installation Method of Pipe                  |                                     |              |          | Flared                       |                   |
| Characteristics                              |                                     |              | Units    | Cooling                      | Heating           |
| Capacity <sup>(4)</sup>                      |                                     |              | Btu/hr   | 20470(5120-22860)            | 22180(6140-26950) |
|  |                                     |              | kW       | 6.00(1.50-6.70)              | 6.50(1.80-7.90)   |
| Power input <sup>(4)</sup>                   |                                     |              | kW       | 1.99(0.50-2.20)              | 1.90(0.45-2.30)   |
| EER (Cooling) or COP(Heating) <sup>(4)</sup> |                                     |              | W/W      | 3.02                         | 3.42              |
| Energy efficiency class                      |                                     |              |          | B                            | B                 |
| Power supply                                 |                                     |              | V        | 220-240                      |                   |
|  |                                     |              | Ph       | Single                       |                   |
|  |                                     |              | Hz       | 50                           |                   |
| Rated current                                |                                     |              | A        | 8.9                          | 8.5               |
| Power factor                                 |                                     |              |          | 0.97                         | 0.97              |
| Prated (IDU)                                 |                                     |              | W        | 59                           |                   |
| Prated (IDU+ODU)                             |                                     |              | W        | 2300                         |                   |
| Starting current                             |                                     |              | A        | 10.5                         |                   |
| Circuit breaker rating                       |                                     |              | A        | 20                           |                   |
| INDOOR                                       | Fan type & quantity                 |              |          | Crossflow x 1                |                   |
|  | Fan speeds                          | H/M/L        | RPM      | 1250/1100/1000               |                   |
|  | Air flow <sup>(1)</sup>             | H/M/L        | m3/hr    | 900/760/620                  |                   |
|  | External static pressure            | Min          | Pa       | 0                            |                   |
|  | Sound power level <sup>(2)</sup>    | H/M/L        | dB(A)    | 59/55/52                     |                   |
|  | Sound pressure level <sup>(3)</sup> | H/M/L        | dB(A)    | 44/40/37                     |                   |
|  | Moisture removal                    |              | l/hr     | 2                            |                   |
|  | Condensate drain tube I.D           |              | mm       | 16                           |                   |
|  | Dimensions                          | WxHxD        | mm       | 1060x295x221                 |                   |
|  | Net Weight                          |              | kg       | 15                           |                   |
|  | Package dimensions                  | WxHxD        | mm       | 1125x360x295                 |                   |
|  | Packaged weight                     |              | kg       | 18                           |                   |
|  | Units per pallet                    |              | units    | 16                           |                   |
|  | Stacking height                     |              | units    | 8 levels                     |                   |
| OUTDOOR                                      | Refrigerant control                 |              |          | EEV                          |                   |
|  | Compressor type,model               |              |          | Scroll,Panasonic 5CS130XCC03 |                   |
|  | Fan type & quantity                 |              |          | Propeller(direct) x 1        |                   |
|  | Fan speeds                          | H            | RPM      | 820                          |                   |
|  | Air flow                            | H            | m3/hr    | 2860                         |                   |
|  | Sound power level                   | H            | dB(A)    | 65                           |                   |
|  | Sound pressure level <sup>(3)</sup> | H            | dB(A)    | 55                           |                   |
|  | Dimensions                          | WxHxD        | mm       | 846x690x302                  |                   |
|  | Net Weight                          |              | kg       | 46                           |                   |
|  | Package dimensions                  | WxHxD        | mm       | 990x770x430                  |                   |
|  | Packaged weight                     |              | kg       | 50                           |                   |
|  | Units per pallet                    |              | Units    | 9                            |                   |
|  | Stacking height                     |              | units    | 3 levels                     |                   |
|  | Refrigerant type                    |              |          | R410A                        |                   |
|  | Standard charge                     |              | kg(7.5m) | 1.65kg                       |                   |
|  | Additional charge                   |              |          | No need                      |                   |
|  | Connections between units           | Liquid line  | In.(mm)  | 1/4"(6.35)                   |                   |
|  |                                     | Suction line | In.(mm)  | 1/2"(12.7)                   |                   |
| Max.tubing length                            |                                     | m.           | 30       |                              |                   |
| Max.height difference                        |                                     | m.           | 10       |                              |                   |
| Operation control type                       |                                     |              |          | Remote control               |                   |
| Heating elements (Option)                    |                                     |              | kW       |                              |                   |
| Others                                       |                                     |              |          |                              |                   |

(1) Rating conditions in accordance with ISO 5151 and ISO 13253 (for ducted units) and EN 14511.

(2) Airflow in ducted units; at nominal external static pressure.

(3) Sound power in ducted units is measured at air discharge.

(4) Sound pressure level measured at 1 meter distance from unit.

## 2.8 HAD024 / GC 24 DCI

|  |                                     |              |          |   |                   |  |
|--|-------------------------------------|--------------|----------|---|-------------------|--|
| Model Indoor Unit                            |                                     |              |          | HAD024 DCI                                    |                   |  |
| Model Outdoor Unit                           |                                     |              |          | GC 24 R410A                                   |                   |  |
| Installation Method of Pipe                  |                                     |              |          | Flared  |                   |  |
| Characteristics                              |                                     |              | Units    | Cooling                                       | Heating           |  |
| Capacity <sup>(4)</sup>                      |                                     |              | Btu/hr   | 23200(5120-25590)                             | 24570(5120-30030) |  |
|  |                                     |              | kW       | 6.80(1.50-7.50)                               | 7.05(1.50-8.80)   |  |
| Power input <sup>(4)</sup>                   |                                     |              | kW       | 2.25(0.5-2.8)                                 | 2.15(0.45-3.0)    |  |
| EER (Cooling) or COP(Heating) <sup>(4)</sup> |                                     |              | W/W      | 3.01  | 3.27              |  |
| Energy efficiency class                      |                                     |              |          | B   | C                 |  |
| Power supply                                 |                                     |              | V        | 220-240                                       |                   |  |
|  |                                     |              | Ph       | Single  |                   |  |
|  |                                     |              | Hz       | 50  |                   |  |
| Rated current                                |                                     |              | A        | 10.0  | 9.6               |  |
| Power factor                                 |                                     |              |          | 0.97  | 0.97              |  |
| Prated (IDU)                                 |                                     |              | W        | 60  |                   |  |
| Prated (IDU+ODU)                             |                                     |              | W        | 3000  |                   |  |
| Starting current                             |                                     |              | A        | 15  |                   |  |
| Circuit breaker rating                       |                                     |              | A        | 20  |                   |  |
| INDOOR                                       | Fan type & quantity                 |              |          | Crossflow x 1                                 |                   |  |
|  | Fan speeds                          | H/M/L        | RPM      | 1350/1150/1000                                |                   |  |
|  | Air flow <sup>(1)</sup>             | H/M/L        | m3/hr    | 960/800/670                                   |                   |  |
|  | External static pressure            | Min          | Pa       | 0   |                   |  |
|  | Sound power level <sup>(2)</sup>    | H/M/L        | dB(A)    | 62/57/54                                      |                   |  |
|  | Sound pressure level <sup>(3)</sup> | H/M/L        | dB(A)    | 47/42/38                                      |                   |  |
|  | Moisture removal                    |              | l/hr     | 2.5   |                   |  |
|  | Condensate drain tube I.D           |              | mm       | 16  |                   |  |
|  | Dimensions                          | WxHxD        | mm       | 1060x295x221                                  |                   |  |
|  | Net Weight                          |              | kg       | 15  |                   |  |
|  | Package dimensions                  | WxHxD        | mm       | 1125x360x295                                  |                   |  |
|  | Packaged weight                     |              | kg       | 18  |                   |  |
|  | Units per pallet                    |              | units    | 16  |                   |  |
|  | Stacking height                     |              | units    | 8 levels                                      |                   |  |
| OUTDOOR                                      | Refrigerant control                 |              |          | EEV   |                   |  |
|  | Compressor type,model               |              |          | Two Rotary,Sanyo(Sheny) C-7RVN153H0W          |                   |  |
|  | Fan type & quantity                 |              |          | Propeller(direct) x 1                         |                   |  |
|  | Fan speeds                          | H            | RPM      | 850   |                   |  |
|  | Air flow                            | H            | m3/hr    | 3600  |                   |  |
|  | Sound power level                   | H            | dB(A)    | 66  |                   |  |
|  | Sound pressure level <sup>(3)</sup> | H            | dB(A)    | 56  |                   |  |
|  | Dimensions                          | WxHxD        | mm       | 950x835x412                                   |                   |  |
|  | Net Weight                          |              | kg       | 64.5  |                   |  |
|  | Package dimensions                  | WxHxD        | mm       | 1080x910x477                                  |                   |  |
|  | Packaged weight                     |              | kg       | 72  |                   |  |
|  | Units per pallet                    |              | Units    | 4   |                   |  |
|  | Stacking height                     |              | units    | 2 levels                                      |                   |  |
|  | Refrigerant type                    |              |          | R410A   |                   |  |
|  | Standard charge                     |              | kg(7.5m) | 2.3kg   |                   |  |
|  | Additional charge                   |              |          | 7.5m<Length =S20m:+0g; 20m <Length ^30m:+300g |                   |  |
|  | Connections between units           | Liquid line  |          | In.(mm)                                       | 3/8"(9.53)        |  |
|  |                                     | Suction line |          | In.(mm)                                       | 5/8"(15.88)       |  |
| Max.tubing length                            |                                     | m.           | 30       |   |                   |  |
| Max.height difference                        |                                     | m.           | 15       |   |                   |  |
| Operation control type                       |                                     |              |          | Remote control                                |                   |  |
| Heating elements (Option)                    |                                     |              | kW       |   |                   |  |
| Others                                       |                                     |              |          |   |                   |  |

(1) Rating conditions in accordance with ISO 5151 and ISO 13253 (for ducted units) and EN 14511.

(2) Airflow in ducted units; at nominal external static pressure.

(3) Sound power in ducted units is measured at air discharge.

(4) Sound pressure level measured at 1 meter distance from unit.

### 3. RATING CONDITIONS

Rating conditions in accordance with ISO 5151 and ISO 13253 (for ducted units).

**Cooling:**

Indoor: 27°C DB 19°C WB

Outdoor: 35°C DB

**Heating:**

Indoor: 20°C DB

Outdoor: 7°C DB 6°C WB

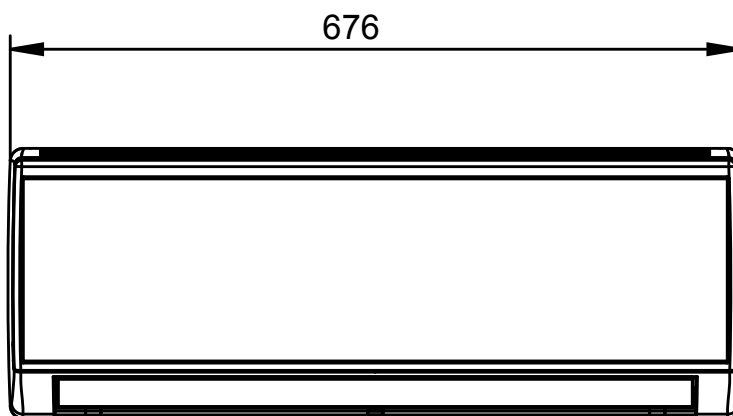
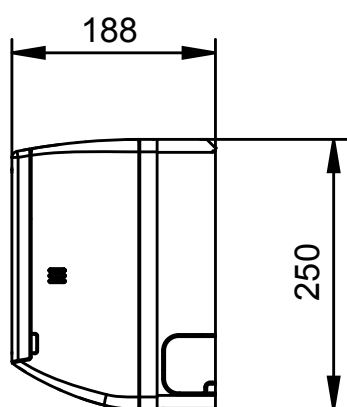
#### 3.1 Operating Limits

##### 3.1.1 R410A

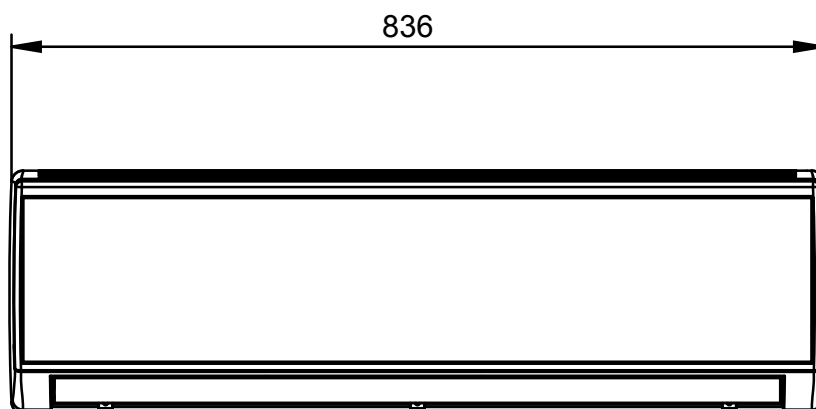
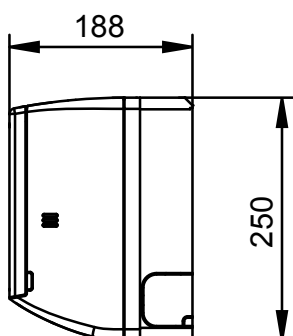
|         |             | Indoor          | Outdoor                        |
|---------|-------------|-----------------|--------------------------------|
| Cooling | Upper limit | 32°C DB 23°C WB | 46°C DB                        |
|         | Lower limit | 21°C DB 15°C WB | -10°C DB<br>(0°C matching GCD) |
| Heating | Upper limit | 27°C DB         | 24°C DB 18°C WB                |
|         | Lower limit | 10°C DB         | -15°C DB -16°C WB              |
| Voltage |             | 198 – 264 V     |                                |

## 4. OUTLINE DIMENSIONS

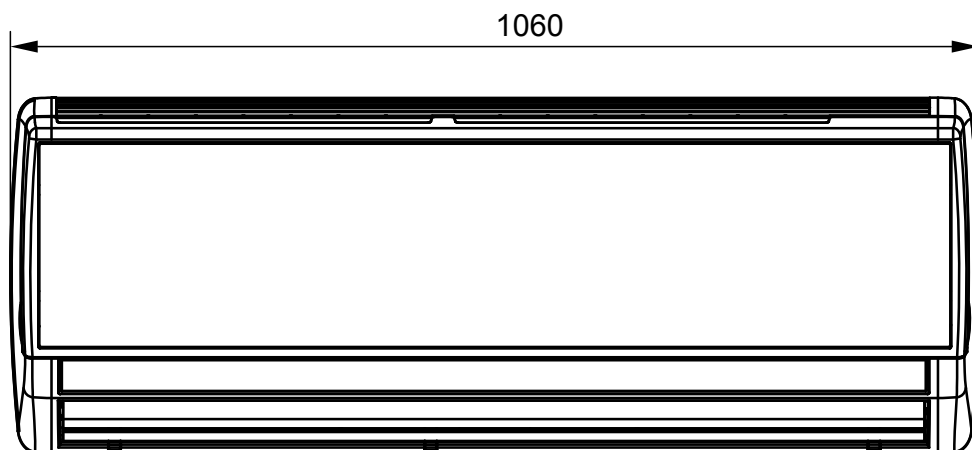
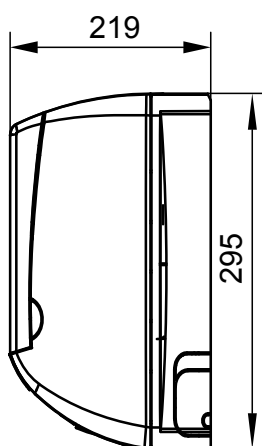
### 4.1 Indoor Unit: HAD007, HAD009



### 4.2 Indoor Unit: HAD012

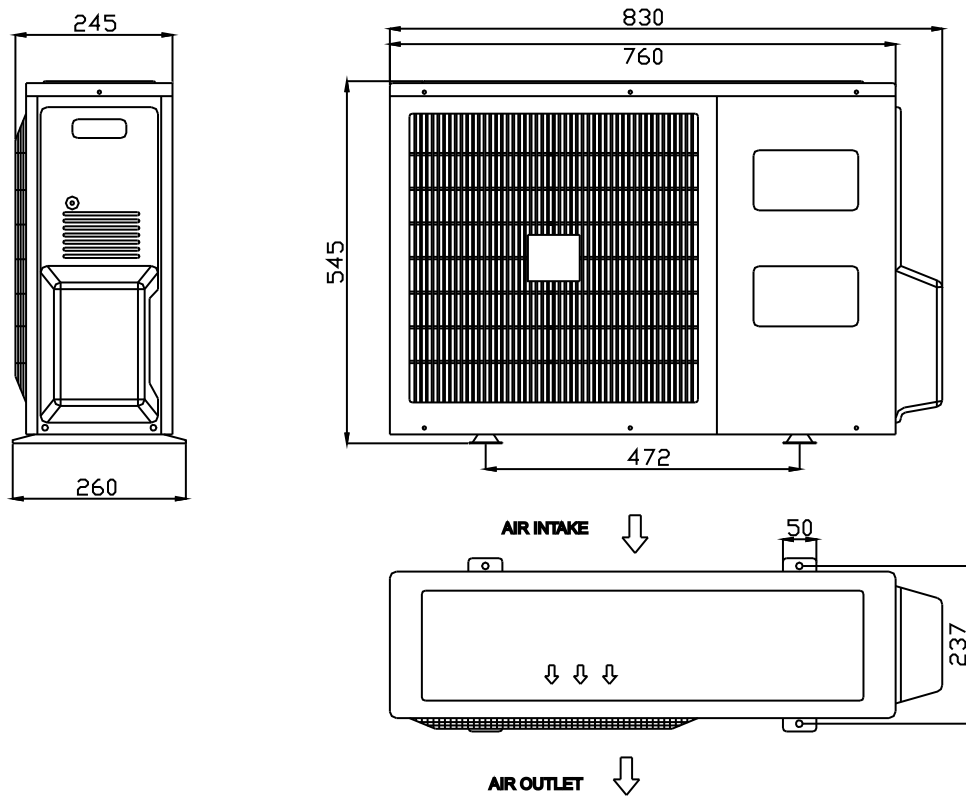


### 4.3 Indoor Unit: HAD018, HAD022, HAD024

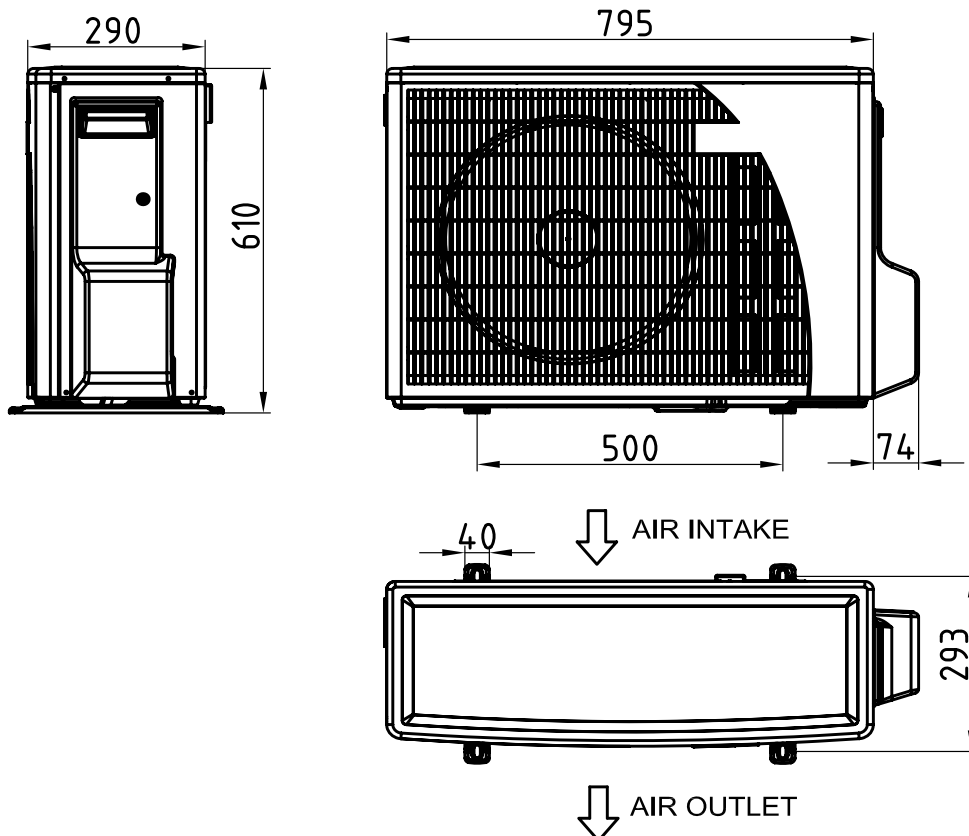




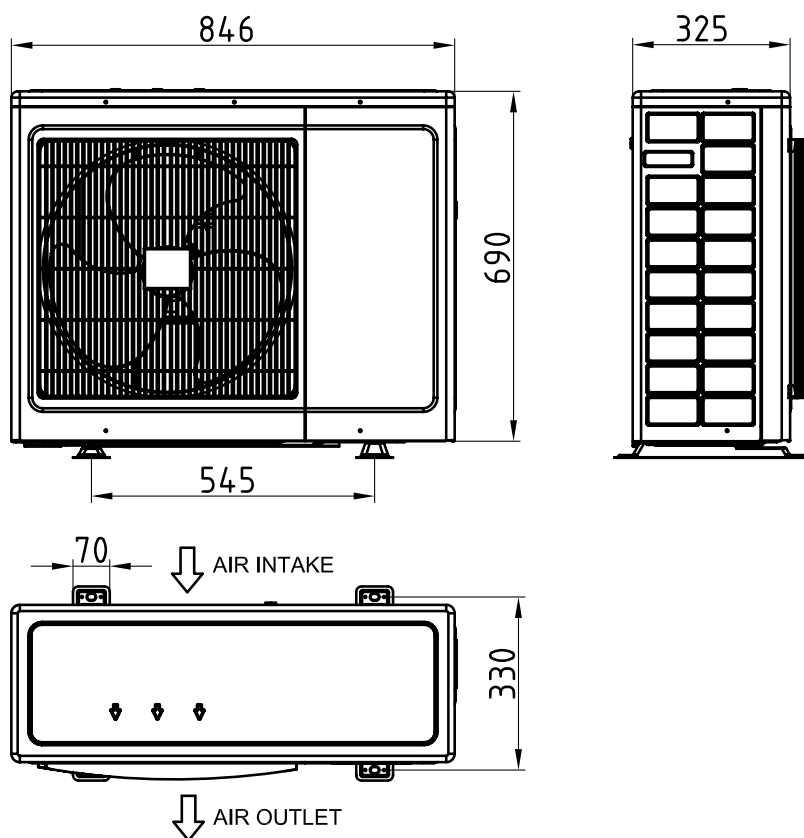
#### 4.4 Outdoor Unit: GC 7, GC 9, GC 12, GCD009, GCD012



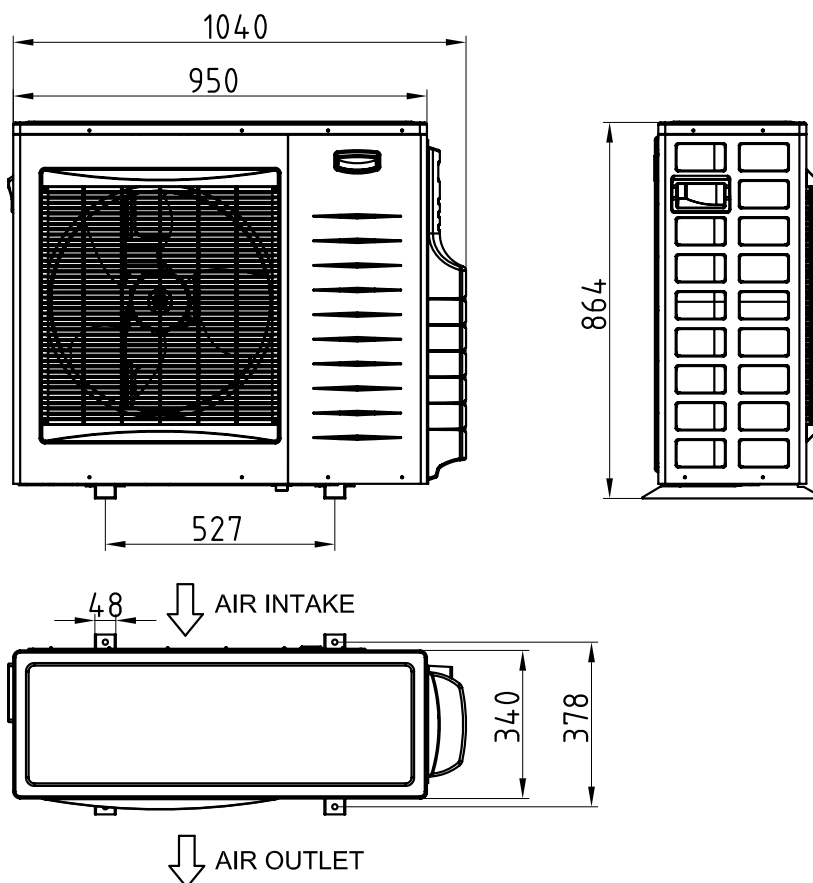
#### 4.5 Outdoor Unit: GC 18



#### 4.6 Outdoor Unit: GC 21



#### 4.7 Outdoor Unit: GC 24



## 5. PERFORMANCE DATA

### 5.1 HAD007 / GC 7 RC DCI

#### 5.1.1 Cooling Capacity (kW) – Run Mode

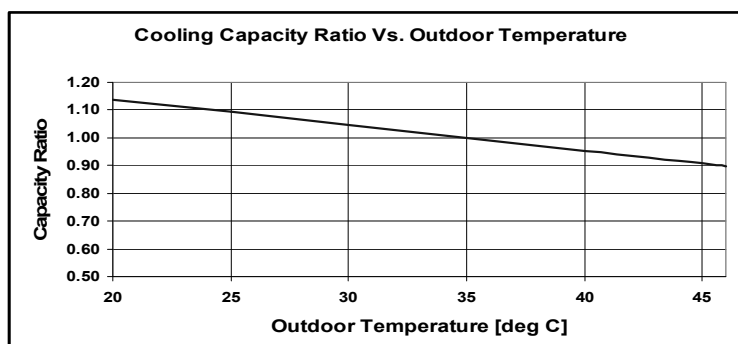
230[V] : Indoor Fan at High Speed.

| OD COIL<br>ENTERING AIR DB<br>TEMPERATURE [°C] | DATA      | ID COIL ENTERING AIR DB/WB TEMPERATURE [°C] |       |             |       |       |
|--|-----------|---|-------|-------------|-------|-------|
|  |           | 22/15                                       | 24/17 | 27/19       | 29/21 | 32/23 |
| <b>-10 - 20</b><br>(protection range)          | <b>TC</b> | 80 - 110 % of nominal                       |       |             |       |       |
|  | <b>SC</b> | 80 - 105 % of nominal                       |       |             |       |       |
|  | <b>PI</b> | 25 - 50 % of nominal                        |       |             |       |       |
| <b>25</b>                                      | <b>TC</b> | 2.08  | 2.21  | 2.35        | 2.49  | 2.62  |
|  | <b>SC</b> | 1.72  | 1.75  | 1.79        | 1.82  | 1.86  |
|  | <b>PI</b> | 0.51  | 0.52  | 0.53        | 0.54  | 0.55  |
| <b>30</b>                                      | <b>TC</b> | 1.98  | 2.11  | 2.25        | 2.39  | 2.52  |
|  | <b>SC</b> | 1.67  | 1.71  | 1.74        | 1.78  | 1.81  |
|  | <b>PI</b> | 0.57  | 0.58  | 0.59        | 0.60  | 0.61  |
| <b>35</b>                                      | <b>TC</b> | 1.88  | 2.01  | <b>2.20</b> | 2.29  | 2.42  |
|  | <b>SC</b> | 1.63  | 1.66  | <b>1.70</b> | 1.74  | 1.77  |
|  | <b>PI</b> | 0.63  | 0.64  | <b>0.65</b> | 0.66  | 0.67  |
| <b>40</b>                                      | <b>TC</b> | 1.78  | 1.91  | 2.05        | 2.19  | 2.32  |
|  | <b>SC</b> | 1.59  | 1.62  | 1.66        | 1.69  | 1.73  |
|  | <b>PI</b> | 0.69  | 0.70  | 0.71        | 0.72  | 0.73  |
| <b>46</b>                                      | <b>TC</b> | 1.66  | 1.79  | 1.93        | 2.07  | 2.20  |
|  | <b>SC</b> | 1.53  | 1.57  | 1.60        | 1.64  | 1.67  |
|  | <b>PI</b> | 0.76  | 0.77  | 0.78        | 0.79  | 0.80  |

#### LEGEND

- TC – Total Cooling Capacity, kW
- SC – Sensible Capacity, kW
- PI – Power Input, kW
- WB – Wet Bulb Temp., (°C)
- DB – Dry Bulb Temp., (°C)
- ID – Indoor
- OD – Outdoor

#### 5.1.2 Capacity Correction Factors



### 5.1.3 Heating Capacity (kW) - Run Mode

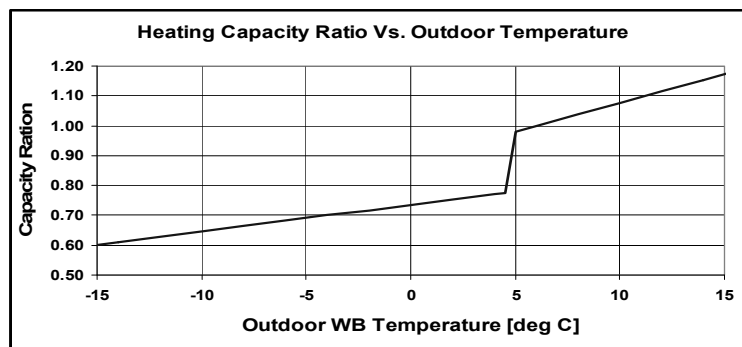
230[V] : Indoor Fan at High Speed.

| OD COIL ENTERING<br>AIR DB/WB<br>TEMPERATURE [°C] |    | ID COIL ENTERING AIR DB TEMPERATURE [°C] |      |      |
|---|----|--|------|------|
|   |    | 15                                       | 20   | 25   |
| -15/-16   | TC | 1.37                                     | 1.28 | 1.18 |
|   | PI | 0.37                                     | 0.40 | 0.44 |
| -10/-12   | TC | 1.53                                     | 1.43 | 1.34 |
|   | PI | 0.44                                     | 0.48 | 0.52 |
| -7/-8   | TC | 1.64                                     | 1.55 | 1.45 |
|   | PI | 0.50                                     | 0.53 | 0.57 |
| -1/-2   | TC | 1.70                                     | 1.61 | 1.51 |
|   | PI | 0.53                                     | 0.56 | 0.60 |
| 2/1   | TC | 1.74                                     | 1.65 | 1.55 |
|   | PI | 0.54                                     | 0.58 | 0.62 |
| 7/6   | TC | 2.25                                     | 2.20 | 2.06 |
|   | PI | 0.57                                     | 0.61 | 0.65 |
| 10/9  | TC | 2.38                                     | 2.28 | 2.18 |
|   | PI | 0.61                                     | 0.64 | 0.68 |
| 15/12   | TC | 2.50                                     | 2.40 | 2.31 |
|   | PI | 0.64                                     | 0.68 | 0.72 |
| 15-24<br>(Protection Range)                       | TC | 85 - 105 % of nominal                    |      |      |
|   | PI | 80 - 120 % of nominal                    |      |      |

#### LEGEND

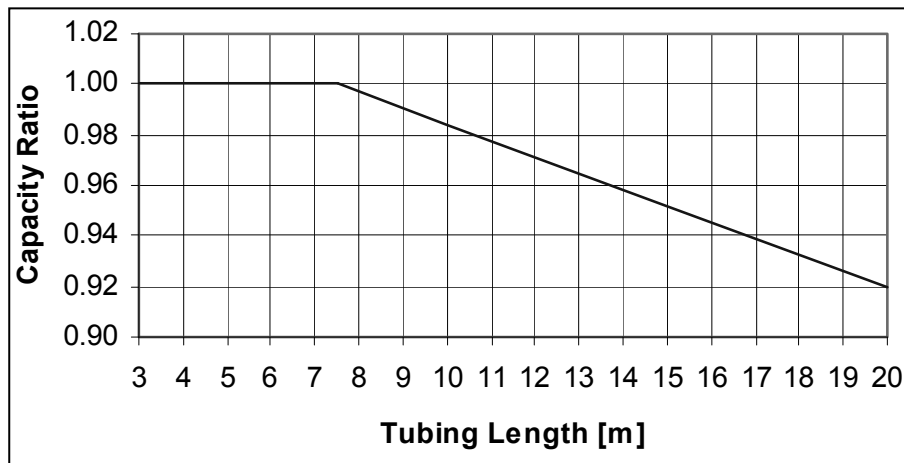
TC – Total Heating Capacity, kW  
 PI – Power Input, kW  
 WB – Wet Bulb Temp., (°C)  
 DB – Dry Bulb Temp., (°C)  
 ID – Indoor  
 OU – Outdoor

### 5.1.4 Capacity Correction Factors

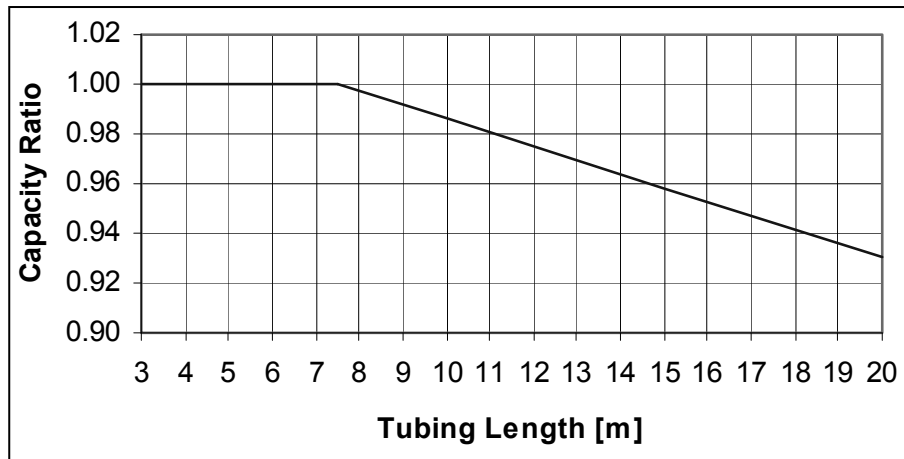


## 5.1.5 Capacity Correction Factor Due to Tubing Length

### 5.1.5.1 Cooling



### 5.1.5.2 Heating



## 5.2 HAD009 / GC 9 RC DCI

### 5.2.1 Cooling Capacity (kW) – Run Mode

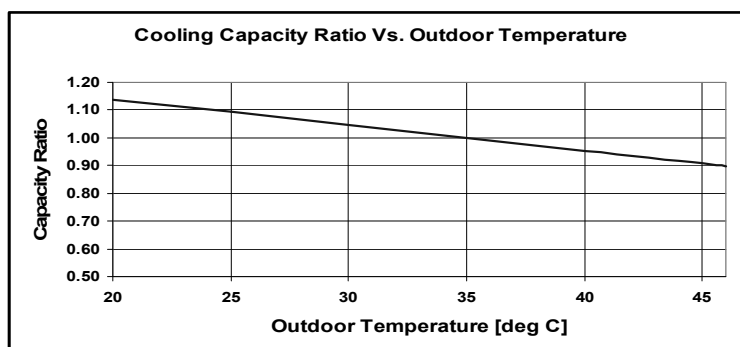
230[V] : Indoor Fan at High Speed.

| OD COIL<br>ENTERING AIR DB<br>TEMPERATURE<br>[°C] | DATA      | ID COIL ENTERING AIR DB/WB TEMPERATURE [°C] |       |             |       |       |
|---|-----------|---|-------|-------------|-------|-------|
|   |           | 22/15                                       | 24/17 | 27/19       | 29/21 | 32/23 |
| <b>-10 - 20</b><br>(protection range)             | <b>TC</b> | 80 - 110 % of nominal                       |       |             |       |       |
|   | <b>SC</b> | 80 - 105 % of nominal                       |       |             |       |       |
|   | <b>PI</b> | 25 - 50 % of nominal                        |       |             |       |       |
| <b>25</b>   | <b>TC</b> | 2.41  | 2.57  | 2.73        | 2.89  | 3.05  |
|   | <b>SC</b> | 1.67  | 1.71  | 1.74        | 1.77  | 1.81  |
|   | <b>PI</b> | 0.59  | 0.60  | 0.61        | 0.62  | 0.63  |
| <b>30</b>   | <b>TC</b> | 2.30  | 2.46  | 2.62        | 2.77  | 2.93  |
|   | <b>SC</b> | 1.63  | 1.67  | 1.70        | 1.73  | 1.77  |
|   | <b>PI</b> | 0.66  | 0.67  | 0.68        | 0.69  | 0.70  |
| <b>35</b>   | <b>TC</b> | 2.18  | 2.34  | <b>2.50</b> | 2.66  | 2.82  |
|   | <b>SC</b> | 1.59  | 1.63  | <b>1.77</b> | 1.89  | 1.92  |
|   | <b>PI</b> | 0.73  | 0.74  | <b>0.75</b> | 0.76  | 0.77  |
| <b>40</b>   | <b>TC</b> | 2.07  | 2.23  | 2.39        | 2.54  | 2.70  |
|   | <b>SC</b> | 1.55  | 1.59  | 1.62        | 1.65  | 1.69  |
|   | <b>PI</b> | 0.80  | 0.81  | 0.82        | 0.83  | 0.84  |
| <b>46</b>   | <b>TC</b> | 1.93  | 2.09  | 2.25        | 2.41  | 2.56  |
|   | <b>SC</b> | 1.50  | 1.54  | 1.57        | 1.61  | 1.64  |
|   | <b>PI</b> | 0.88  | 0.89  | 0.90        | 0.91  | 0.92  |

### LEGEND

- TC – Total Cooling Capacity, kW
- SC – Sensible Capacity, kW
- PI – Power Input, kW
- WB – Wet Bulb Temp., (°C)
- DB – Dry Bulb Temp., (°C)
- ID – Indoor
- OD – Outdoor

### 5.2.2 Capacity Correction Factors



### 5.2.3 Heating Capacity (kW) - Run Mode

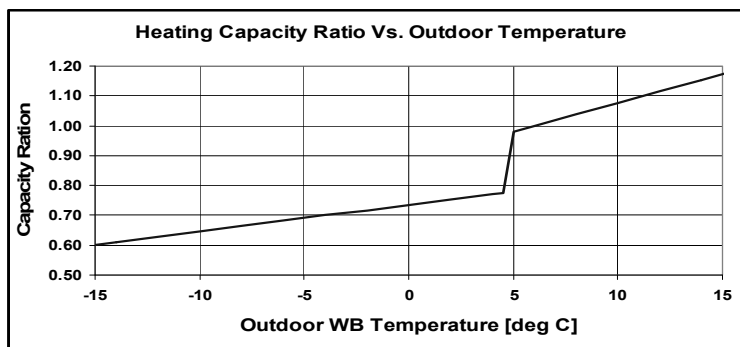
230[V] : Indoor Fan at High Speed.

| OD COIL ENTERING AIR DB/WB TEMPERATURE [°C] |    | DATA | ID COIL ENTERING AIR DB TEMPERATURE [°C] |      |      |
|---|----|------|--|------|------|
|   |    |      | 15                                       | 20   | 25   |
| -15/-16                                     | TC |      | 1.57                                     | 1.46 | 1.35 |
|   | PI |      | 0.41                                     | 0.46 | 0.50 |
| -10/-12                                     | TC |      | 1.74                                     | 1.63 | 1.52 |
|   | PI |      | 0.50                                     | 0.54 | 0.58 |
| -7/-8                                       | TC |      | 1.88                                     | 1.77 | 1.66 |
|   | PI |      | 0.56                                     | 0.60 | 0.65 |
| -1/-2                                       | TC |      | 1.94                                     | 1.83 | 1.72 |
|   | PI |      | 0.59                                     | 0.64 | 0.68 |
| 2/1   | TC |      | 1.99                                     | 1.88 | 1.77 |
|   | PI |      | 0.62                                     | 0.66 | 0.70 |
| 7/6   | TC |      | 2.57                                     | 2.50 | 2.35 |
|   | PI |      | 0.65                                     | 0.69 | 0.73 |
| 10/9  | TC |      | 2.71                                     | 2.60 | 2.49 |
|   | PI |      | 0.69                                     | 0.73 | 0.77 |
| 15/12                                       | TC |      | 2.85                                     | 2.74 | 2.63 |
|   | PI |      | 0.73                                     | 0.77 | 0.81 |
| 15-24<br>(Protection Range)                 | TC |      | 85 - 105 % of nominal                    |      |      |
|   | PI |      | 80 - 120 % of nominal                    |      |      |

#### LEGEND

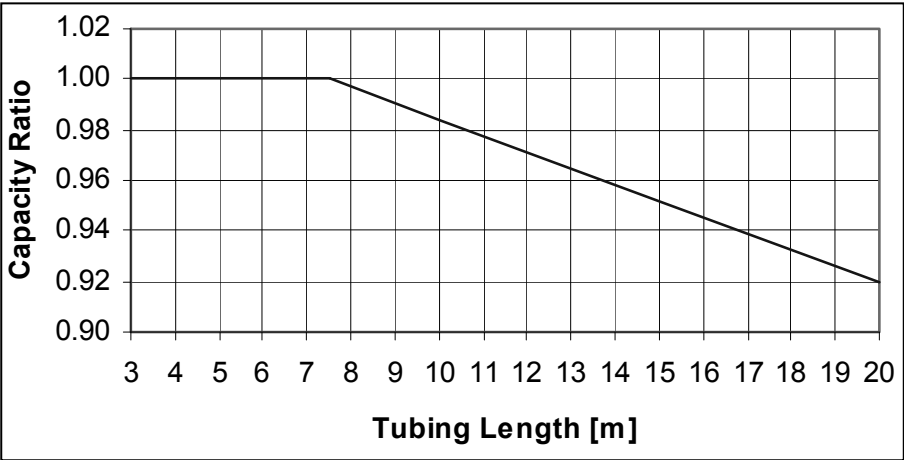
TC – Total Heating Capacity, kW  
 PI – Power Input, kW  
 WB – Wet Bulb Temp., (°C)  
 DB – Dry Bulb Temp., (°C)  
 ID – Indoor  
 OU – Outdoor

### 5.2.4 Capacity Correction Factors

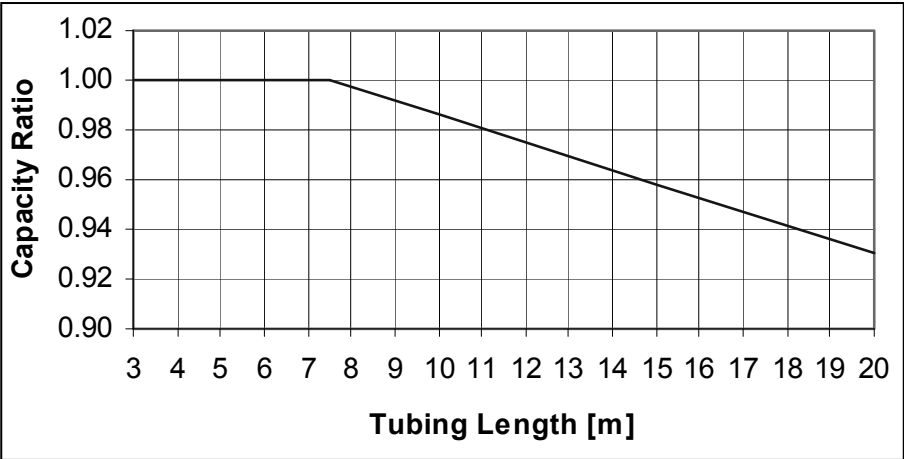


5.2.5 Capacity Correction Factor Due to Tubing Length

5.2.5.1 Cooling



5.2.5.2 Heating





### 5.3 HAD012 / GC 12 RC DCI

#### 5.3.1 Cooling Capacity (kW) - Run Mode

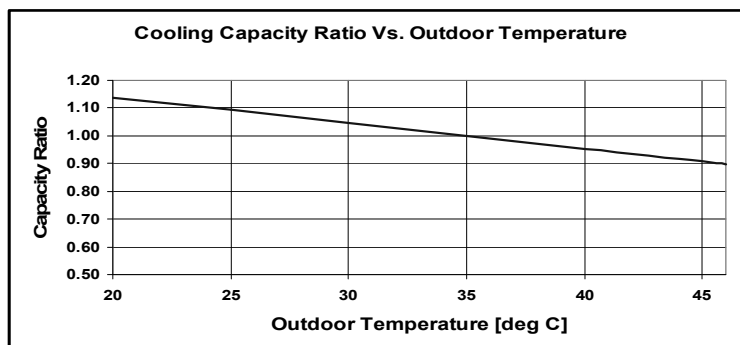
230[V] : Indoor Fan at High Speed.

| OD COIL<br>ENTERING AIR DB<br>TEMPERATURE [°C] | DATA      | ID COIL ENTERING AIR DB/WB TEMPERATURE [°C] |       |             |       |       |
|--|-----------|---|-------|-------------|-------|-------|
|  |           | 22/15                                       | 24/17 | 27/19       | 29/21 | 32/23 |
| <b>-10 - 20</b><br>(protection range)          | <b>TC</b> | 80 - 110 % of nominal                       |       |             |       |       |
|  | <b>SC</b> | 80 - 105 % of nominal                       |       |             |       |       |
|  | <b>PI</b> | 25 - 50 % of nominal                        |       |             |       |       |
| <b>25</b>                                      | <b>TC</b> | 3.26  | 3.48  | 3.69        | 3.90  | 4.12  |
|  | <b>SC</b> | 2.59  | 2.64  | 2.69        | 2.75  | 2.80  |
|  | <b>PI</b> | 0.79  | 0.80  | 0.82        | 0.83  | 0.85  |
| <b>30</b>                                      | <b>TC</b> | 3.11  | 3.32  | 3.53        | 3.75  | 3.96  |
|  | <b>SC</b> | 2.52  | 2.58  | 2.63        | 2.68  | 2.73  |
|  | <b>PI</b> | 0.88  | 0.89  | 0.91        | 0.92  | 0.94  |
| <b>35</b>                                      | <b>TC</b> | 2.95  | 3.16  | <b>3.50</b> | 3.59  | 3.80  |
|  | <b>SC</b> | 2.46  | 2.51  | <b>2.56</b> | 2.62  | 2.67  |
|  | <b>PI</b> | 0.97  | 0.99  | <b>1.00</b> | 1.02  | 1.03  |
| <b>40</b>                                      | <b>TC</b> | 2.79  | 3.01  | 3.22        | 3.43  | 3.65  |
|  | <b>SC</b> | 2.39  | 2.44  | 2.50        | 2.55  | 2.60  |
|  | <b>PI</b> | 1.06  | 1.08  | 1.09        | 1.11  | 1.12  |
| <b>46</b>                                      | <b>TC</b> | 2.60  | 2.82  | 3.03        | 3.24  | 3.46  |
|  | <b>SC</b> | 2.31  | 2.37  | 2.42        | 2.47  | 2.52  |
|  | <b>PI</b> | 1.17  | 1.19  | 1.20        | 1.22  | 1.23  |

#### LEGEND

TC – Total Cooling Capacity, kW  
 SC – Sensible Capacity, kW  
 PI – Power Input, kW  
 WB – Wet Bulb Temp., (°C)  
 DB – Dry Bulb Temp., (°C)  
 ID – Indoor  
 OD – Outdoor

#### 5.3.2 Capacity Correction Factors



### 5.3.3 Heating Capacity (kW) - Run Mode

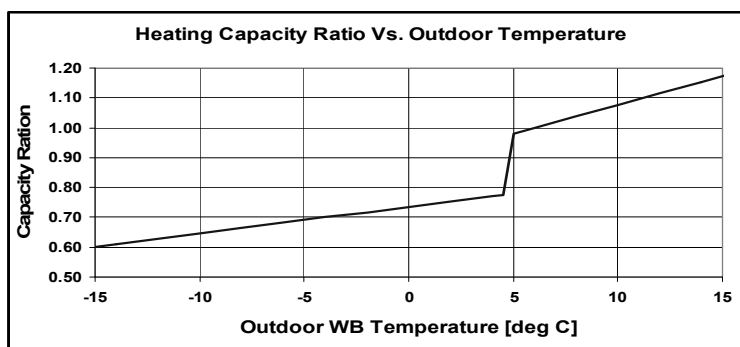
230[V] : Indoor Fan at High Speed.

| OD COIL ENTERING AIR DB/WB TEMPERATURE [°C] | DATA | ID COIL ENTERING AIR DB TEMPERATURE [°C] |      |      |
|---|------|--|------|------|
|   |      | 15                                       | 20   | 25   |
| -15/-16                                     | TC   | 2.17                                     | 2.02 | 1.86 |
|   | PI   | 0.58                                     | 0.64 | 0.70 |
| -10/-12                                     | TC   | 2.41                                     | 2.26 | 2.11 |
|   | PI   | 0.70                                     | 0.76 | 0.82 |
| -7/-8                                       | TC   | 2.60                                     | 2.44 | 2.29 |
|   | PI   | 0.79                                     | 0.85 | 0.91 |
| -1/-2                                       | TC   | 2.69                                     | 2.54 | 2.38 |
|   | PI   | 0.84                                     | 0.90 | 0.95 |
| 2/1   | TC   | 2.75                                     | 2.60 | 2.45 |
|   | PI   | 0.87                                     | 0.93 | 0.98 |
| 7/6   | TC   | 3.56                                     | 3.60 | 3.25 |
|   | PI   | 0.91                                     | 0.97 | 1.03 |
| 10/9  | TC   | 3.75                                     | 3.60 | 3.45 |
|   | PI   | 0.97                                     | 1.02 | 1.08 |
| 15/12                                       | TC   | 3.95                                     | 3.80 | 3.64 |
|   | PI   | 1.02                                     | 1.08 | 1.14 |
| 15-24                                       | TC   | 85 - 105 % of nominal                    |      |      |
| (Protection Range)                          | PI   | 80 - 120 % of nominal                    |      |      |

#### LEGEND

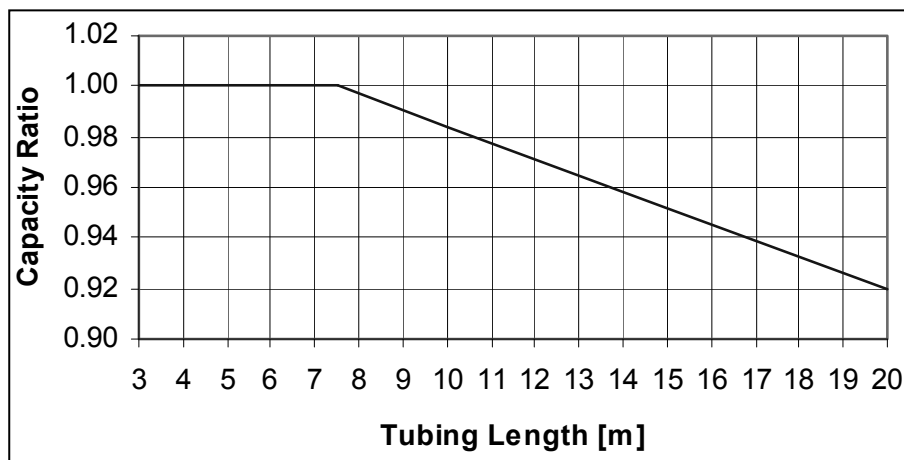
TC – Total Heating Capacity, kW  
 PI – Power Input, kW  
 WB – Wet Bulb Temp., (°C)  
 DB – Dry Bulb Temp., (°C)  
 ID – Indoor  
 OU – Outdoor

### 5.3.4 Capacity Correction Factors

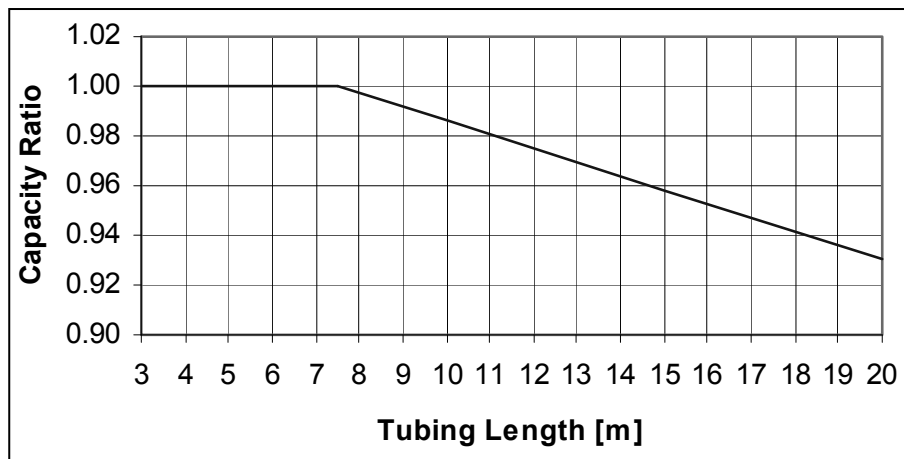


### 5.3.5 Capacity Correction Factor Due to Tubing Length

#### 5.3.5.1 Cooling



#### 5.3.5.2 Heating



## 5.4 HAD009 / GCD009

### 5.4.1 Cooling Capacity (kW) – Run Mode

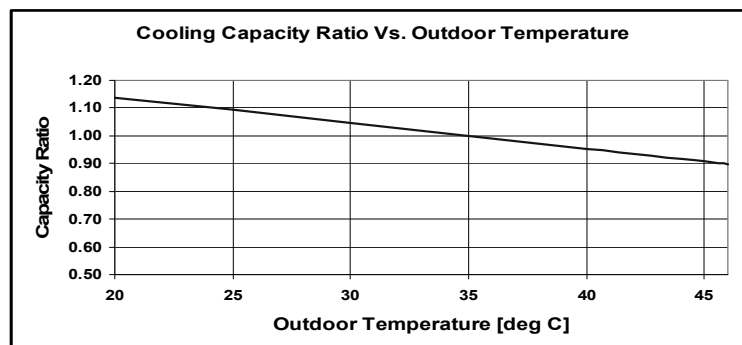
230[V] : Indoor Fan at High Speed.

| OD COIL<br>ENTERING AIR DB<br>TEMPERATURE<br>[°C] | DATA      | ID COIL ENTERING AIR DB/WB TEMPERATURE [°C] |       |             |       |       |
|---|-----------|---|-------|-------------|-------|-------|
|   |           | 22/15                                       | 24/17 | 27/19       | 29/21 | 32/23 |
| <b>-10 - 20</b><br>(protection range)             | <b>TC</b> | 80 - 110 % of nominal                       |       |             |       |       |
|   | <b>SC</b> | 80 - 105 % of nominal                       |       |             |       |       |
|   | <b>PI</b> | 25 - 50 % of nominal                        |       |             |       |       |
| <b>25</b>   | <b>TC</b> | 2.41  | 2.57  | 2.73        | 2.89  | 3.05  |
|   | <b>SC</b> | 1.67  | 1.71  | 1.74        | 1.77  | 1.81  |
|   | <b>PI</b> | 0.59  | 0.60  | 0.61        | 0.62  | 0.63  |
| <b>30</b>   | <b>TC</b> | 2.30  | 2.46  | 2.62        | 2.77  | 2.93  |
|   | <b>SC</b> | 1.63  | 1.67  | 1.70        | 1.73  | 1.77  |
|   | <b>PI</b> | 0.66  | 0.67  | 0.68        | 0.69  | 0.70  |
| <b>35</b>   | <b>TC</b> | 2.18  | 2.34  | <b>2.50</b> | 2.66  | 2.82  |
|   | <b>SC</b> | 1.59  | 1.63  | <b>1.77</b> | 1.69  | 1.73  |
|   | <b>PI</b> | 0.73  | 0.74  | <b>0.73</b> | 0.76  | 0.77  |
| <b>40</b>   | <b>TC</b> | 2.07  | 2.23  | 2.39        | 2.54  | 2.70  |
|   | <b>SC</b> | 1.55  | 1.59  | 1.62        | 1.65  | 1.69  |
|   | <b>PI</b> | 0.80  | 0.81  | 0.82        | 0.83  | 0.84  |
| <b>46</b>   | <b>TC</b> | 1.93  | 2.09  | 2.25        | 2.41  | 2.56  |
|   | <b>SC</b> | 1.50  | 1.54  | 1.57        | 1.61  | 1.64  |
|   | <b>PI</b> | 0.88  | 0.89  | 0.90        | 0.91  | 0.92  |

### LEGEND

TC – Total Cooling Capacity, kW  
 SC – Sensible Capacity, kW  
 PI – Power Input, kW  
 WB – Wet Bulb Temp., (°C)  
 DB – Dry Bulb Temp., (°C)  
 ID – Indoor  
 OD – Outdoor

### 5.4.2 Capacity Correction Factors



### 5.4.3 Heating Capacity (kW) - Run Mode

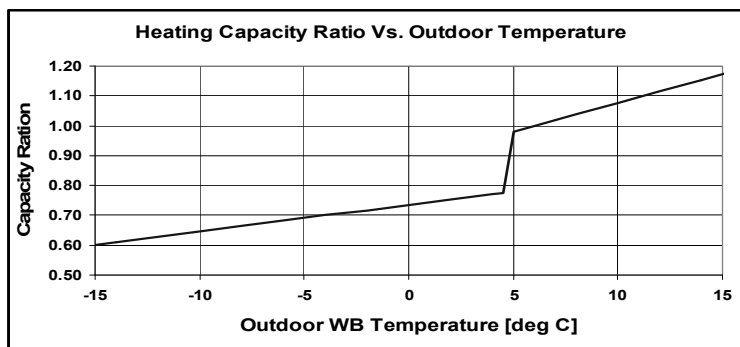
230[V] : Indoor Fan at High Speed.

| OD COIL ENTERING AIR DB/WB TEMPERATURE [°C] |    | ID COIL ENTERING AIR DB TEMPERATURE [°C] |      |      |
|---|----|--|------|------|
|   |    | 15                                       | 20   | 25   |
| -15/-16                                     | TC | 1.78                                     | 1.66 | 1.53 |
|   | PI | 0.49                                     | 0.54 | 0.59 |
| -10/-12                                     | TC | 1.98                                     | 1.86 | 1.73 |
|   | PI | 0.59                                     | 0.64 | 0.69 |
| -7/-8                                       | TC | 2.14                                     | 2.01 | 1.89 |
|   | PI | 0.67                                     | 0.72 | 0.77 |
| -1/-2                                       | TC | 2.21                                     | 2.09 | 1.96 |
|   | PI | 0.71                                     | 0.76 | 0.81 |
| 2/1   | TC | 2.26                                     | 2.14 | 2.01 |
|   | PI | 0.73                                     | 0.78 | 0.83 |
| 7/6   | TC | 2.92                                     | 2.50 | 2.68 |
|   | PI | 0.77                                     | 0.69 | 0.87 |
| 10/9  | TC | 3.09                                     | 2.96 | 2.84 |
|   | PI | 0.82                                     | 0.87 | 0.92 |
| 15/12                                       | TC | 3.25                                     | 3.12 | 3.00 |
|   | PI | 0.86                                     | 0.91 | 0.96 |
| 15-24<br>(Protection Range)                 | TC | 85 - 105 % of nominal                    |      |      |
|   | PI | 80 - 120 % of nominal                    |      |      |

#### LEGEND

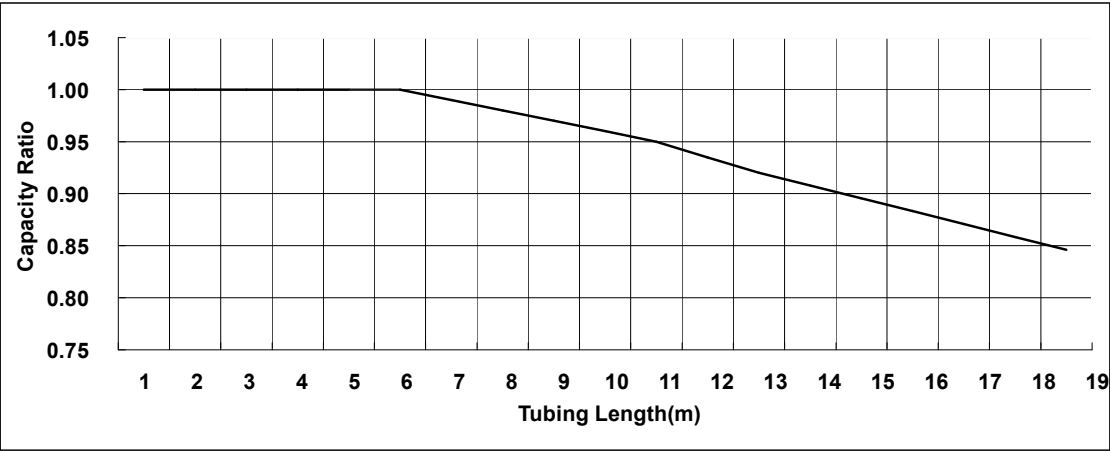
TC – Total Heating Capacity, kW  
 PI – Power Input, kW  
 WB – Wet Bulb Temp., (°C)  
 DB – Dry Bulb Temp., (°C)  
 ID – Indoor  
 OU – Outdoor

### 5.4.4 Capacity Correction Factors

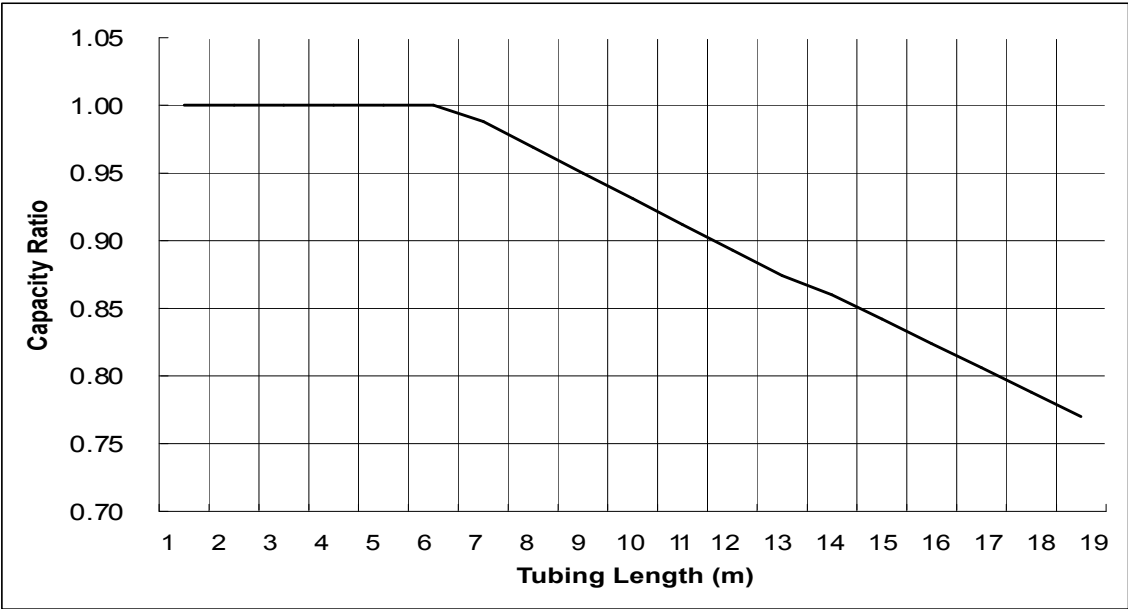


5.4.5 Capacity Correction Factor Due to Tubing Length

5.4.5.1 Cooling



5.4.5.2 Heating



## 5.5 HAD012 / GCD012

### 5.5.1 Cooling Capacity (kW) – Run Mode

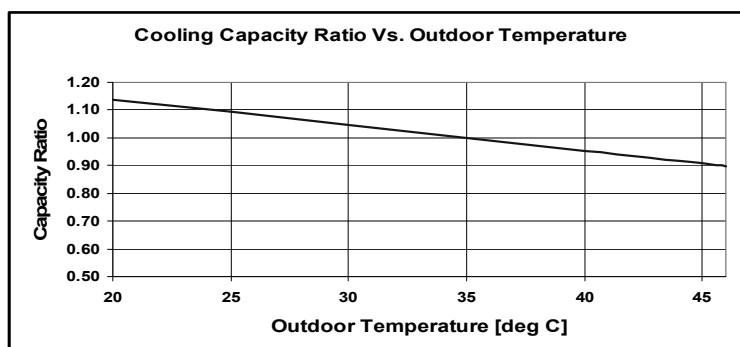
230[V] : Indoor Fan at High Speed.

| OD COIL<br>ENTERING AIR DB<br>TEMPERATURE<br>[°C] | DATA      | ID COIL ENTERING AIR DB/WB TEMPERATURE [°C] |       |             |       |       |
|---|-----------|---|-------|-------------|-------|-------|
|   |           | 22/15                                       | 24/17 | 27/19       | 29/21 | 32/23 |
| <b>-10 - 20</b><br>(protection range)             | <b>TC</b> | 80 - 110 % of nominal                       |       |             |       |       |
|   | <b>SC</b> | 80 - 105 % of nominal                       |       |             |       |       |
|   | <b>PI</b> | 25 - 50 % of nominal                        |       |             |       |       |
| <b>25</b>   | <b>TC</b> | 3.38  | 3.60  | 3.82        | 4.04  | 4.26  |
|   | <b>SC</b> | 2.54  | 2.59  | 2.64        | 2.69  | 2.74  |
|   | <b>PI</b> | 0.81  | 0.83  | 0.84        | 0.86  | 0.87  |
| <b>30</b>   | <b>TC</b> | 3.22  | 3.44  | 3.66        | 3.88  | 4.10  |
|   | <b>SC</b> | 2.48  | 2.53  | 2.58        | 2.63  | 2.68  |
|   | <b>PI</b> | 0.90  | 0.92  | 0.94        | 0.95  | 0.97  |
| <b>35</b>   | <b>TC</b> | 3.06  | 3.28  | <b>3.50</b> | 3.72  | 3.94  |
|   | <b>SC</b> | 2.42  | 2.47  | <b>2.58</b> | 2.57  | 2.62  |
|   | <b>PI</b> | 1.00  | 1.01  | <b>1.09</b> | 1.05  | 1.06  |
| <b>40</b>   | <b>TC</b> | 2.90  | 3.12  | 3.34        | 3.56  | 3.78  |
|   | <b>SC</b> | 2.36  | 2.41  | 2.46        | 2.51  | 2.56  |
|   | <b>PI</b> | 1.09  | 1.11  | 1.12        | 1.14  | 1.16  |
| <b>46</b>   | <b>TC</b> | 2.70  | 2.92  | 3.15        | 3.37  | 3.59  |
|   | <b>SC</b> | 2.28  | 2.34  | 2.39        | 2.44  | 2.49  |
|   | <b>PI</b> | 1.21  | 1.22  | 1.24        | 1.25  | 1.27  |

### LEGEND

TC – Total Cooling Capacity, kW  
 SC – Sensible Capacity, kW  
 PI – Power Input, kW  
 WB – Wet Bulb Temp., (°C)  
 DB – Dry Bulb Temp., (°C)  
 ID – Indoor  
 OD – Outdoor

### 5.5.2 Capacity Correction Factors



### 5.5.3 Heating Capacity (kW) - Run Mode

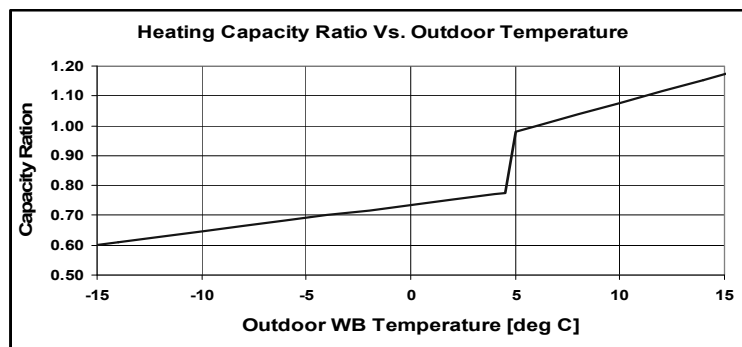
230[V] : Indoor Fan at High Speed.

| OD COIL<br>ENTERING<br>AIR DB/WB<br>TEMPERATURE<br>[°C] | DATA | ID COIL ENTERING AIR DB TEMPERATURE [°C] |      |      |
|---|------|--|------|------|
|   |      | 15                                       | 20   | 25   |
| -15/-16   | TC   | 2.29                                     | 2.13 | 1.97 |
|   | PI   | 0.63                                     | 0.69 | 0.76 |
| -10/-12   | TC   | 2.55                                     | 2.39 | 2.23 |
|   | PI   | 0.76                                     | 0.82 | 0.89 |
| -7/-8   | TC   | 2.75                                     | 2.58 | 2.42 |
|   | PI   | 0.86                                     | 0.92 | 0.98 |
| -1/-2   | TC   | 2.84                                     | 2.68 | 2.52 |
|   | PI   | 0.91                                     | 0.97 | 1.03 |
| 2/1   | TC   | 2.91                                     | 2.75 | 2.59 |
|   | PI   | 0.94                                     | 1.00 | 1.07 |
| 7/6   | TC   | 3.76                                     | 3.50 | 3.44 |
|   | PI   | 0.99                                     | 0.97 | 1.11 |
| 10/9  | TC   | 3.97                                     | 3.81 | 3.65 |
|   | PI   | 1.04                                     | 1.11 | 1.17 |
| 15/12   | TC   | 4.17                                     | 4.01 | 3.85 |
|   | PI   | 1.10                                     | 1.17 | 1.23 |
| 15-24<br>(Protection Range)                             | TC   | 85 - 105 % of nominal                    |      |      |
|   | PI   | 80 - 120 % of nominal                    |      |      |

#### LEGEND

TC – Total Heating Capacity, kW  
 PI – Power Input, kW  
 WB – Wet Bulb Temp., (°C)  
 DB – Dry Bulb Temp., (°C)  
 ID – Indoor  
 OU – Outdoor

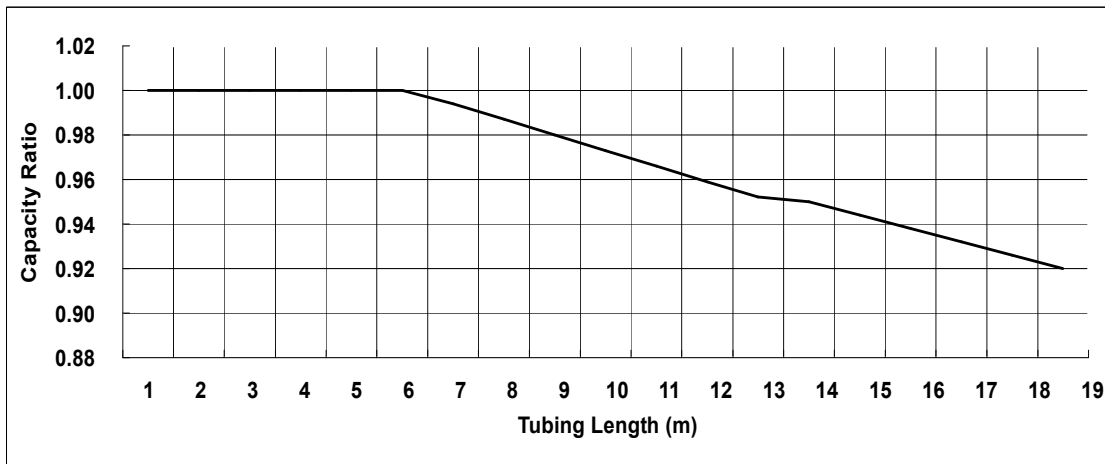
### 5.5.4 Capacity Correction Factors



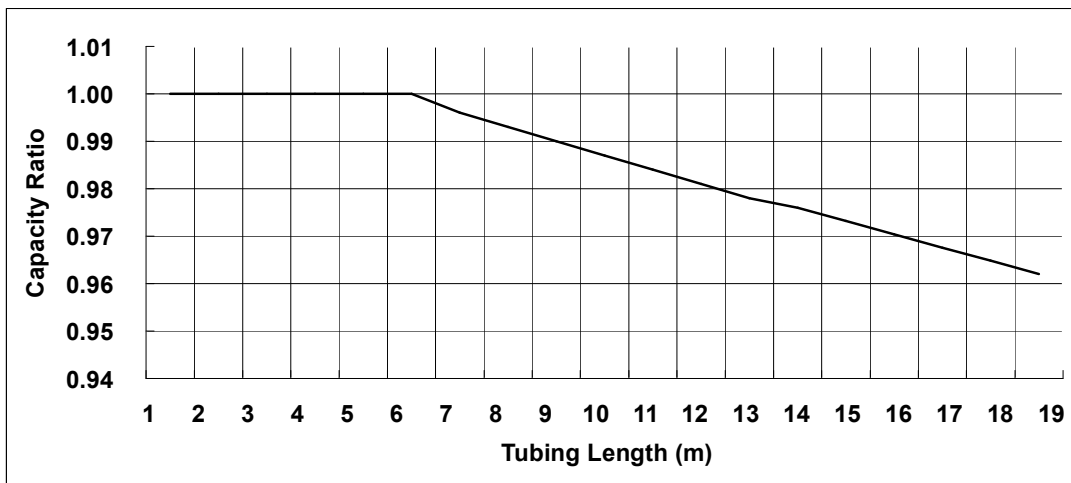


## 5.5.5 Capacity Correction Factor Due to Tubing Length

### 5.5.5.1 Cooling



### 5.5.5.2 Heating



## 5.6 HAD018 / GC 18

### 5.6.1 Cooling Capacity (kW) – Run Mode

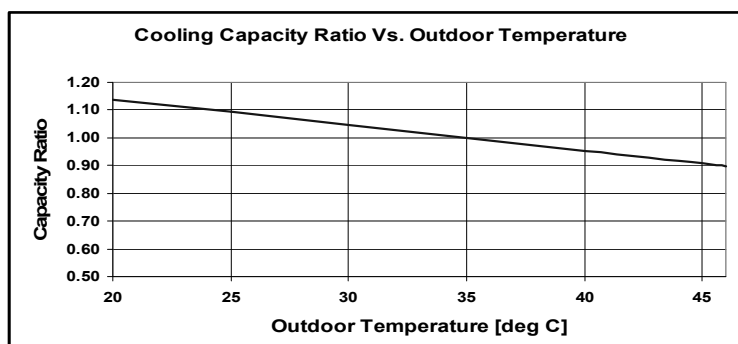
230[V] : Indoor Fan at High Speed.

| OD COIL<br>ENTERING AIR DB<br>TEMPERATURE [°C] | DATA      | ID COIL ENTERING AIR DB/WB TEMPERATURE [°C] |       |             |       |       |
|--|-----------|---|-------|-------------|-------|-------|
|  |           | 22/15                                       | 24/17 | 27/19       | 29/21 | 32/23 |
| <b>-10 - 20</b><br>(protection range)          | <b>TC</b> | 80 - 110 % of nominal                       |       |             |       |       |
|  | <b>SC</b> | 80 - 105 % of nominal                       |       |             |       |       |
|  | <b>PI</b> | 25 - 50 % of nominal                        |       |             |       |       |
| <b>25</b>                                      | <b>TC</b> | 4.93  | 5.22  | 5.51        | 5.80  | 6.09  |
|  | <b>SC</b> | 4.10  | 4.16  | 4.22        | 4.28  | 4.34  |
|  | <b>PI</b> | 1.10  | 1.13  | 1.15        | 1.18  | 1.20  |
| <b>30</b>                                      | <b>TC</b> | 4.67  | 4.96  | 5.25        | 5.54  | 5.83  |
|  | <b>SC</b> | 3.94  | 4.00  | 4.06        | 4.12  | 4.18  |
|  | <b>PI</b> | 1.26  | 1.28  | 1.31        | 1.33  | 1.36  |
| <b>35</b>                                      | <b>TC</b> | 4.42  | 4.71  | <b>5.00</b> | 5.29  | 5.58  |
|  | <b>SC</b> | 3.78  | 3.84  | <b>3.90</b> | 3.96  | 4.02  |
|  | <b>PI</b> | 1.41  | 1.44  | <b>1.46</b> | 1.48  | 1.51  |
| <b>40</b>                                      | <b>TC</b> | 4.17  | 4.46  | 4.75        | 5.04  | 5.33  |
|  | <b>SC</b> | 3.62  | 3.68  | 3.74        | 3.80  | 3.86  |
|  | <b>PI</b> | 1.56  | 1.59  | 1.61        | 1.64  | 1.66  |
| <b>46</b>                                      | <b>TC</b> | 3.86  | 4.15  | 4.44        | 4.73  | 5.02  |
|  | <b>SC</b> | 3.43  | 3.49  | 3.55        | 3.61  | 3.67  |
|  | <b>PI</b> | 1.75  | 1.77  | 1.80        | 1.82  | 1.85  |

### LEGEND

- TC – Total Cooling Capacity, kW
- SC – Sensible Capacity, kW
- PI – Power Input, kW
- WB – Wet Bulb Temp., (°C)
- DB – Dry Bulb Temp., (°C)
- ID – Indoor
- OD – Outdoor

### 5.6.2 Capacity Correction Factors



### 5.6.3 Heating Capacity (kW) - Run Mode

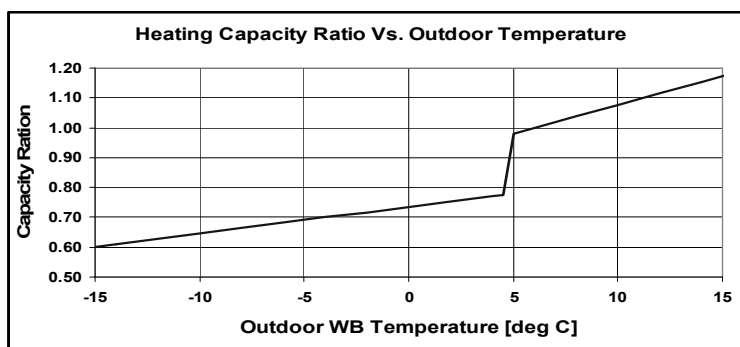
230[V] : Indoor Fan at High Speed.

| OD COIL ENTERING<br>AIR DB/WB<br>TEMPERATURE [°C] | DATA | ID COIL ENTERING AIR DB TEMPERATURE [°C] |      |      |
|---|------|--|------|------|
|   |      | 15                                       | 20   | 25   |
| -15/-16   | TC   | 2.73                                     | 2.34 | 1.94 |
|   | PI   | 1.16                                     | 1.24 | 1.33 |
| -10/-12   | TC   | 3.60                                     | 3.21 | 2.82 |
|   | PI   | 1.31                                     | 1.40 | 1.48 |
| -7/-8   | TC   | 4.26                                     | 3.87 | 3.47 |
|   | PI   | 1.43                                     | 1.51 | 1.59 |
| -1/-2   | TC   | 4.59                                     | 4.19 | 3.80 |
|   | PI   | 1.48                                     | 1.57 | 1.65 |
| 2/1   | TC   | 4.81                                     | 4.41 | 4.02 |
|   | PI   | 1.52                                     | 1.60 | 1.69 |
| 7/6   | TC   | 6.39                                     | 6.00 | 5.61 |
|   | PI   | 1.58                                     | 1.66 | 1.74 |
| 10/9  | TC   | 6.72                                     | 6.33 | 5.94 |
|   | PI   | 1.61                                     | 1.69 | 1.77 |
| 15/12   | TC   | 7.06                                     | 6.66 | 6.27 |
|   | PI   | 1.64                                     | 1.72 | 1.80 |
| 15-24<br>(Protection Range)                       | TC   | 85 - 105 % of nominal                    |      |      |
|   | PI   | 80 - 120 % of nominal                    |      |      |

#### LEGEND

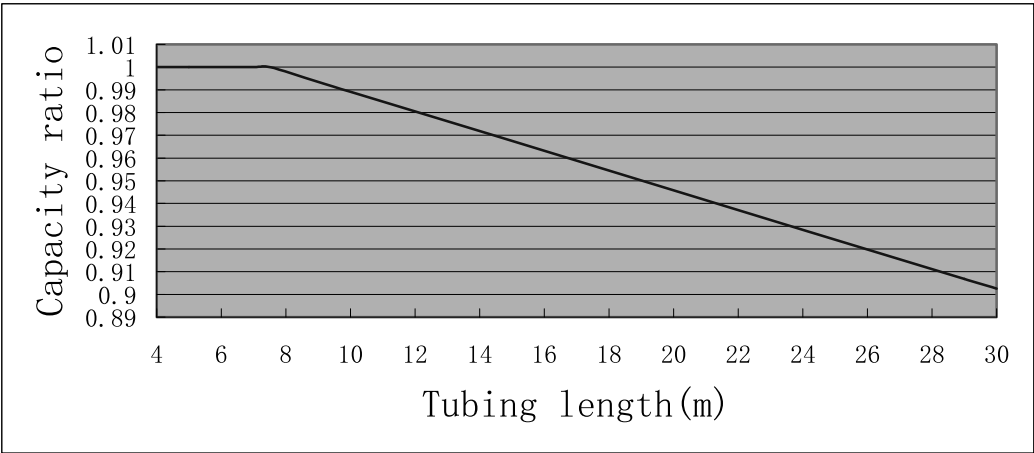
TC – Total Heating Capacity, kW  
 PI – Power Input, kW  
 WB – Wet Bulb Temp., (°C)  
 DB – Dry Bulb Temp., (°C)  
 ID – Indoor  
 OU – Outdoor

### 5.6.4 Capacity Correction Factors

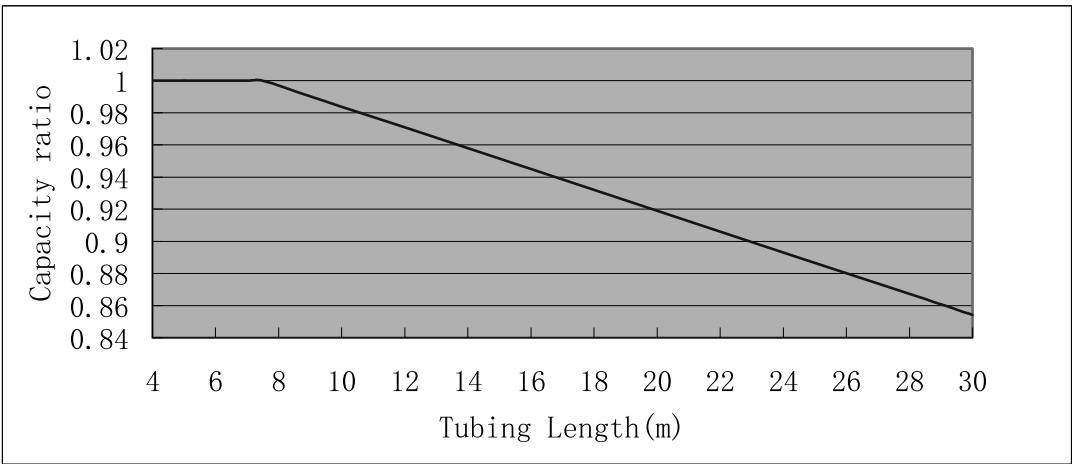


5.6.5 Capacity Correction Factor Due to Tubing Length

5.6.5.1 Cooling



5.6.5.2 Heating



## 5.7 HAD022 / GC 21

### 5.7.1 Cooling Capacity (kW) – Run Mode

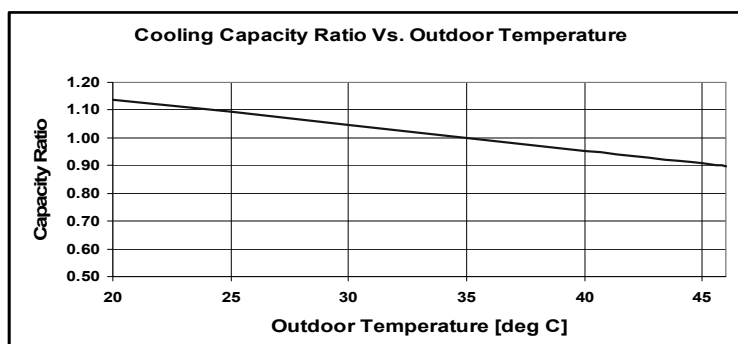
230[V] : Indoor Fan at High Speed.

| OD COIL<br>ENTERING AIR DB<br>TEMPERATURE [°C] | DATA      | ID COIL ENTERING AIR DB/WB TEMPERATURE [°C] |       |             |       |       |
|--|-----------|---|-------|-------------|-------|-------|
|  |           | 22/15                                       | 24/17 | 27/19       | 29/21 | 32/23 |
| <b>-10 - 20</b><br>(protection range)          | <b>TC</b> | 80 - 110 % of nominal                       |       |             |       |       |
|  | <b>SC</b> | 80 - 105 % of nominal                       |       |             |       |       |
|  | <b>PI</b> | 25 - 50 % of nominal                        |       |             |       |       |
| <b>25</b>                                      | <b>TC</b> | 5.91  | 6.26  | 6.61        | 6.95  | 7.30  |
|  | <b>SC</b> | 4.64  | 4.71  | 4.78        | 4.85  | 4.92  |
|  | <b>PI</b> | 1.50  | 1.54  | 1.57        | 1.61  | 1.64  |
| <b>30</b>                                      | <b>TC</b> | 5.61  | 5.96  | 6.30        | 6.65  | 7.00  |
|  | <b>SC</b> | 4.46  | 4.53  | 4.60        | 4.67  | 4.74  |
|  | <b>PI</b> | 1.71  | 1.75  | 1.78        | 1.81  | 1.85  |
| <b>35</b>                                      | <b>TC</b> | 5.30  | 5.65  | <b>6.00</b> | 6.35  | 6.70  |
|  | <b>SC</b> | 4.28  | 4.35  | <b>4.42</b> | 4.49  | 4.56  |
|  | <b>PI</b> | 1.92  | 1.96  | <b>1.99</b> | 2.02  | 2.06  |
| <b>40</b>                                      | <b>TC</b> | 5.00  | 5.35  | 5.70        | 6.05  | 6.39  |
|  | <b>SC</b> | 4.10  | 4.17  | 4.24        | 4.31  | 4.38  |
|  | <b>PI</b> | 2.13  | 2.17  | 2.20        | 2.23  | 2.27  |
| <b>46</b>                                      | <b>TC</b> | 4.64  | 4.99  | 5.33        | 5.68  | 6.03  |
|  | <b>SC</b> | 3.88  | 3.95  | 4.02        | 4.09  | 4.16  |
|  | <b>PI</b> | 2.38  | 2.42  | 2.45        | 2.48  | 2.52  |

### LEGEND

- TC – Total Cooling Capacity, kW
- SC – Sensible Capacity, kW
- PI – Power Input, kW
- WB – Wet Bulb Temp., (°C)
- DB – Dry Bulb Temp., (°C)
- ID – Indoor
- OD – Outdoor

### 5.7.2 Capacity Correction Factors



### 5.7.3 Heating Capacity (kW) - Run Mode

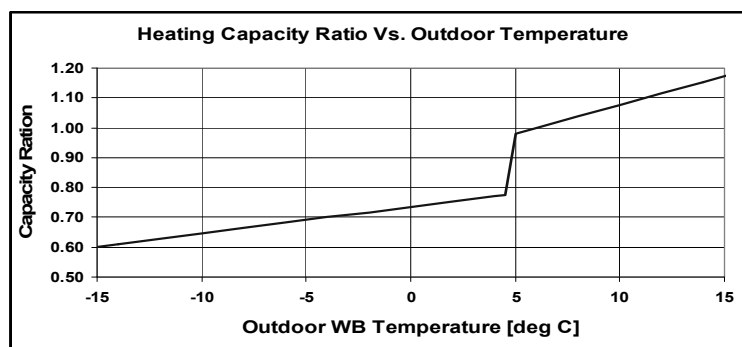
230[V] : Indoor Fan at High Speed.

| OD COIL ENTERING<br>AIR DB/WB<br>TEMPERATURE [°C] | DATA | ID COIL ENTERING AIR DB TEMPERATURE [°C] |      |      |
|---|------|--|------|------|
|   |      | 15                                       | 20   | 25   |
| -15/-16   | TC   | 2.96                                     | 2.53 | 2.11 |
|   | PI   | 1.33                                     | 1.42 | 1.52 |
| -10/-12   | TC   | 3.90                                     | 3.48 | 3.05 |
|   | PI   | 1.50                                     | 1.60 | 1.69 |
| -7/-8   | TC   | 4.61                                     | 4.19 | 3.76 |
|   | PI   | 1.63                                     | 1.73 | 1.82 |
| -1/-2   | TC   | 4.97                                     | 4.54 | 4.12 |
|   | PI   | 1.70                                     | 1.79 | 1.89 |
| 2/1   | TC   | 5.21                                     | 4.78 | 4.35 |
|   | PI   | 1.74                                     | 1.84 | 1.93 |
| 7/6   | TC   | 6.93                                     | 6.50 | 6.07 |
|   | PI   | 1.81                                     | 1.90 | 2.00 |
| 10/9  | TC   | 7.28                                     | 6.86 | 6.43 |
|   | PI   | 1.84                                     | 1.93 | 2.03 |
| 15/12   | TC   | 7.64                                     | 7.22 | 6.79 |
|   | PI   | 1.87                                     | 1.97 | 2.06 |
| 15-24<br>(Protection Range)                       | TC   | 85 - 105 % of nominal                    |      |      |
|   | PI   | 80 - 120 % of nominal                    |      |      |

#### LEGEND

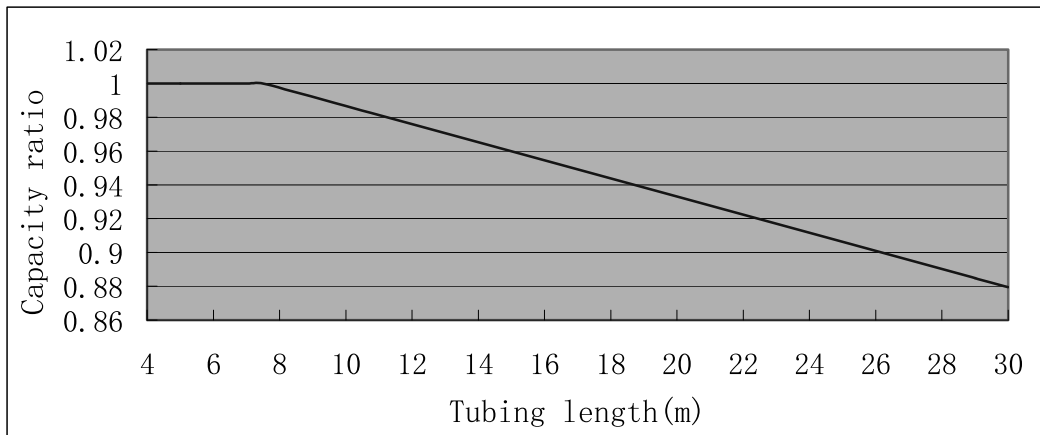
TC – Total Heating Capacity, kW  
 PI – Power Input, kW  
 WB – Wet Bulb Temp., (°C)  
 DB – Dry Bulb Temp., (°C)  
 ID – Indoor  
 OU – Outdoor

### 5.7.4 Capacity Correction Factors

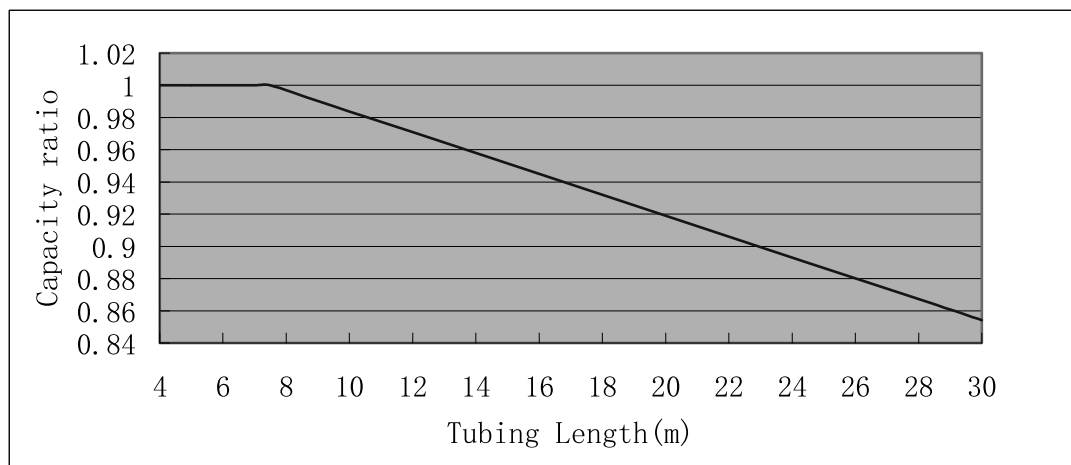


## 5.7.5 Capacity Correction Factor Due to Tubing Length

### 5.7.5.1 Cooling



### 5.7.5.2 Heating



## 5.8 HAD024 / GC 24

### 5.8.1 Cooling Capacity (kW) – Run Mode

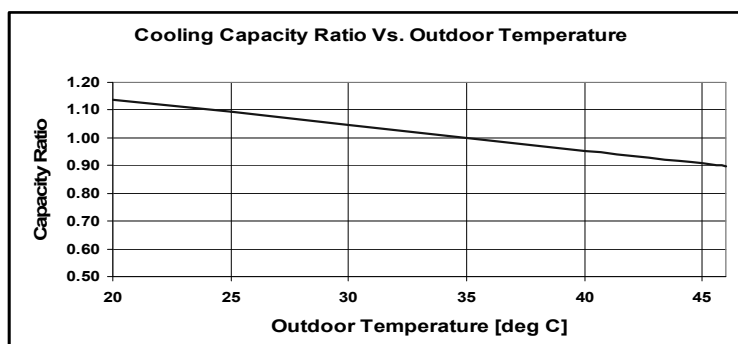
230[V] : Indoor Fan at High Speed.

| OD COIL<br>ENTERING AIR DB<br>TEMPERATURE [°C] | DATA      | ID COIL ENTERING AIR DB/WB TEMPERATURE [°C] |       |             |       |       |
|--|-----------|---|-------|-------------|-------|-------|
|  |           | 22/15                                       | 24/17 | 27/19       | 29/21 | 32/23 |
| <b>-10 - 20</b><br>(protection range)          | <b>TC</b> | 80 - 110 % of nominal                       |       |             |       |       |
|  | <b>SC</b> | 80 - 105 % of nominal                       |       |             |       |       |
|  | <b>PI</b> | 25 - 50 % of nominal                        |       |             |       |       |
| <b>25</b>                                      | <b>TC</b> | 6.70  | 7.09  | 7.49        | 7.88  | 8.28  |
|  | <b>SC</b> | 5.04  | 5.12  | 5.19        | 5.27  | 5.34  |
|  | <b>PI</b> | 1.70  | 1.74  | 1.78        | 1.82  | 1.85  |
| <b>30</b>                                      | <b>TC</b> | 6.35  | 6.75  | 7.14        | 7.54  | 7.93  |
|  | <b>SC</b> | 4.85  | 4.92  | 5.00        | 5.07  | 5.15  |
|  | <b>PI</b> | 1.94  | 1.98  | 2.01        | 2.05  | 2.09  |
| <b>35</b>                                      | <b>TC</b> | 6.01  | 6.41  | <b>6.80</b> | 7.19  | 7.59  |
|  | <b>SC</b> | 4.65  | 4.73  | <b>4.80</b> | 4.87  | 4.95  |
|  | <b>PI</b> | 2.17  | 2.21  | <b>2.25</b> | 2.29  | 2.33  |
| <b>40</b>                                      | <b>TC</b> | 5.67  | 6.06  | 6.46        | 6.85  | 7.25  |
|  | <b>SC</b> | 4.45  | 4.53  | 4.60        | 4.68  | 4.75  |
|  | <b>PI</b> | 2.41  | 2.45  | 2.49        | 2.52  | 2.56  |
| <b>46</b>                                      | <b>TC</b> | 5.26  | 5.65  | 6.04        | 6.44  | 6.83  |
|  | <b>SC</b> | 4.22  | 4.29  | 4.37        | 4.44  | 4.52  |
|  | <b>PI</b> | 2.69  | 2.73  | 2.77        | 2.81  | 2.85  |

### LEGEND

- TC – Total Cooling Capacity, kW
- SC – Sensible Capacity, kW
- PI – Power Input, kW
- WB – Wet Bulb Temp., (°C)
- DB – Dry Bulb Temp., (°C)
- ID – Indoor
- OD – Outdoor

### 5.8.2 Capacity Correction Factors





### 5.8.3 Heating Capacity (kW) - Run Mode

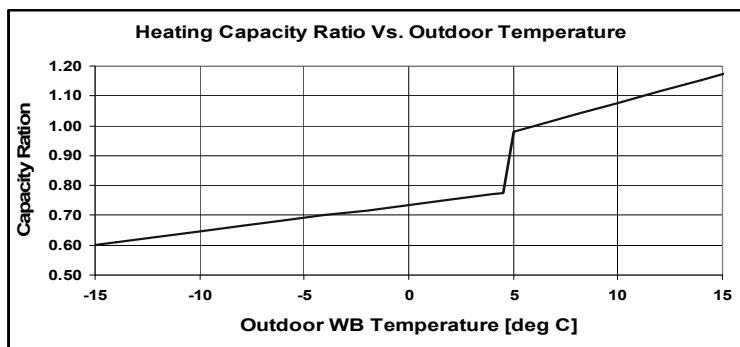
230[V] : Indoor Fan at High Speed.

| OD COIL ENTERING<br>AIR DB/WB<br>TEMPERATURE [°C] | DATA | ID COIL ENTERING AIR DB TEMPERATURE [°C] |      |      |
|---|------|--|------|------|
|   |      | 15                                       | 20   | 25   |
| -15/-16   | TC   | 3.21                                     | 2.75 | 2.28 |
|   | PI   | 1.53                                     | 1.64 | 1.75 |
| -10/-12   | TC   | 4.23                                     | 3.77 | 3.31 |
|   | PI   | 1.73                                     | 1.84 | 1.95 |
| -7/-8   | TC   | 5.00                                     | 4.54 | 4.08 |
|   | PI   | 1.88                                     | 1.99 | 2.10 |
| -1/-2   | TC   | 5.39                                     | 4.93 | 4.47 |
|   | PI   | 1.96                                     | 2.07 | 2.17 |
| 2/1   | TC   | 5.65                                     | 5.18 | 4.72 |
|   | PI   | 2.01                                     | 2.12 | 2.22 |
| 7/6   | TC   | 7.51                                     | 7.05 | 6.59 |
|   | PI   | 2.08                                     | 2.15 | 2.30 |
| 10/9  | TC   | 7.90                                     | 7.44 | 6.98 |
|   | PI   | 2.12                                     | 2.23 | 2.34 |
| 15/12   | TC   | 8.29                                     | 7.83 | 7.37 |
|   | PI   | 2.16                                     | 2.27 | 2.38 |
| 15-24<br>(Protection Range)                       | TC   | 85 - 105 % of nominal                    |      |      |
|   | PI   | 80 - 120 % of nominal                    |      |      |

#### LEGEND

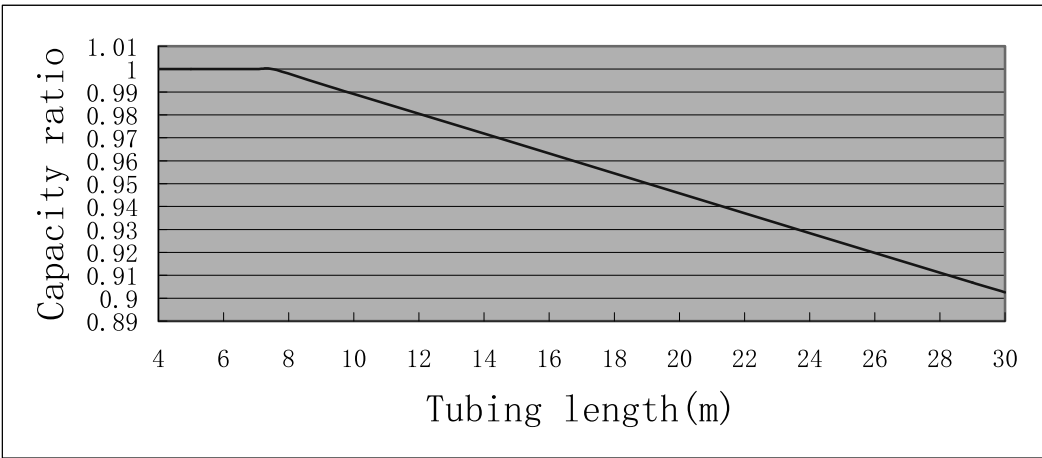
TC – Total Heating Capacity, kW  
 PI – Power Input, kW  
 WB – Wet Bulb Temp., (°C)  
 DB – Dry Bulb Temp., (°C)  
 ID – Indoor  
 OU – Outdoor

### 5.8.4 Capacity Correction Factors

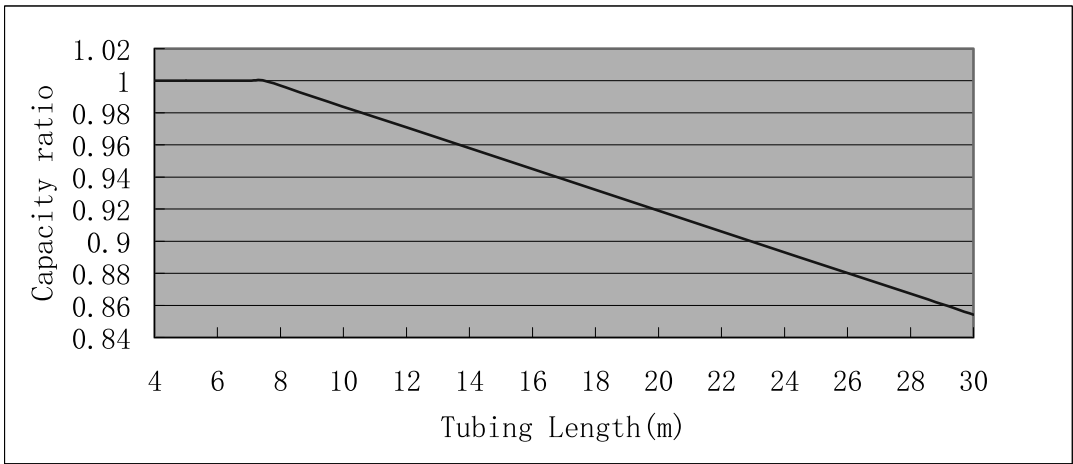


5.8.5 Capacity Correction Factor Due to Tubing Length

5.8.5.1 Cooling

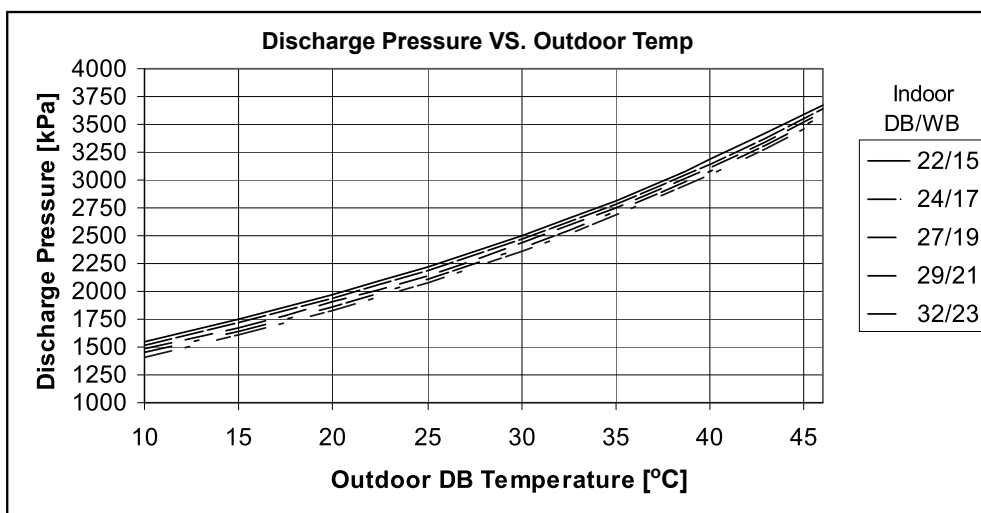
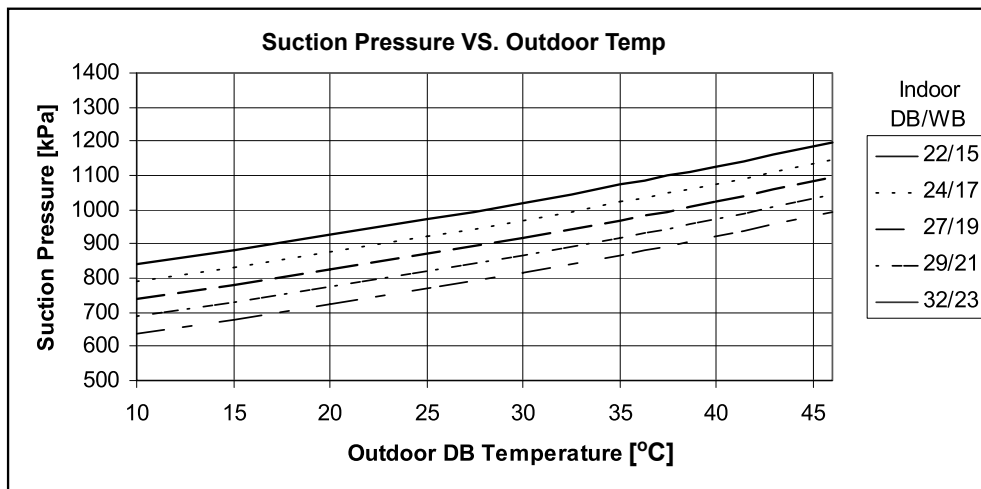


5.8.5.2 Heating

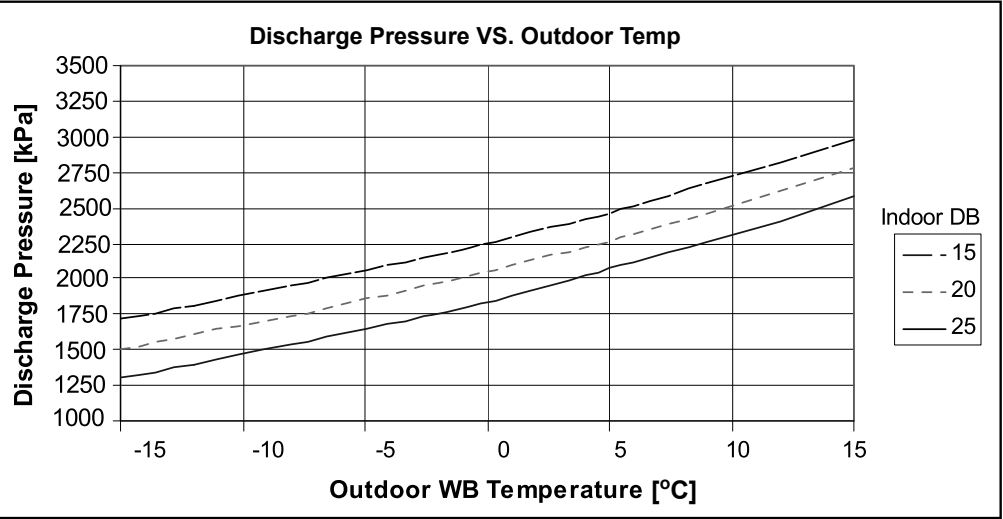
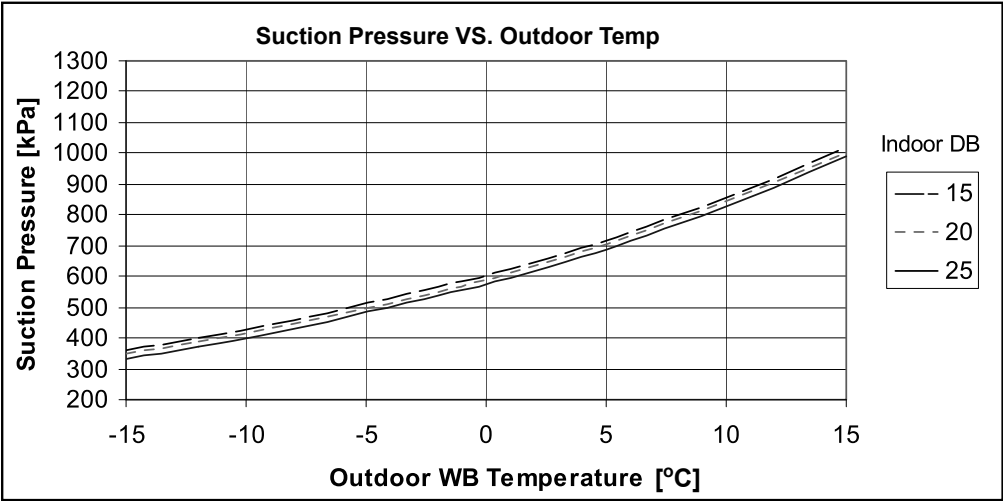


## 5.9 Model: HAD007 / GC 7 RC DCI

### 5.9.1 Cooling

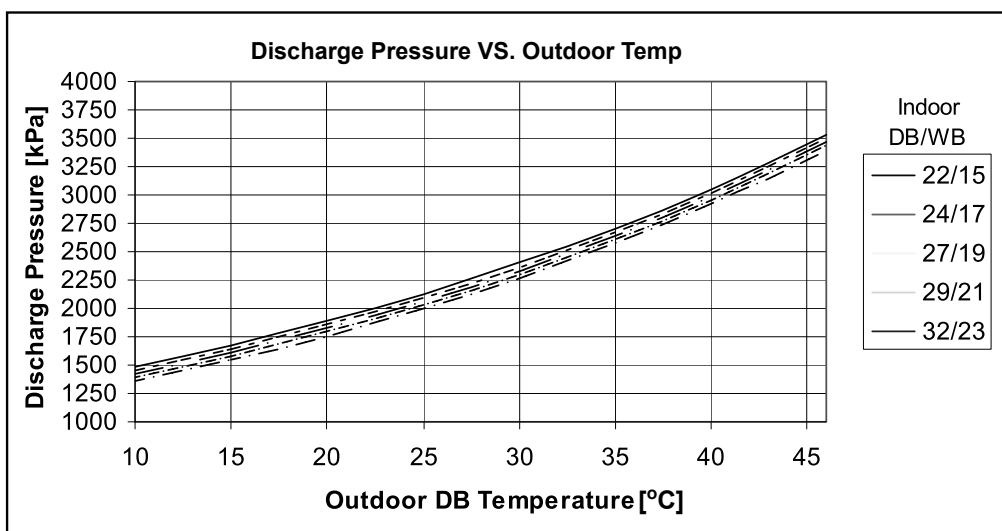
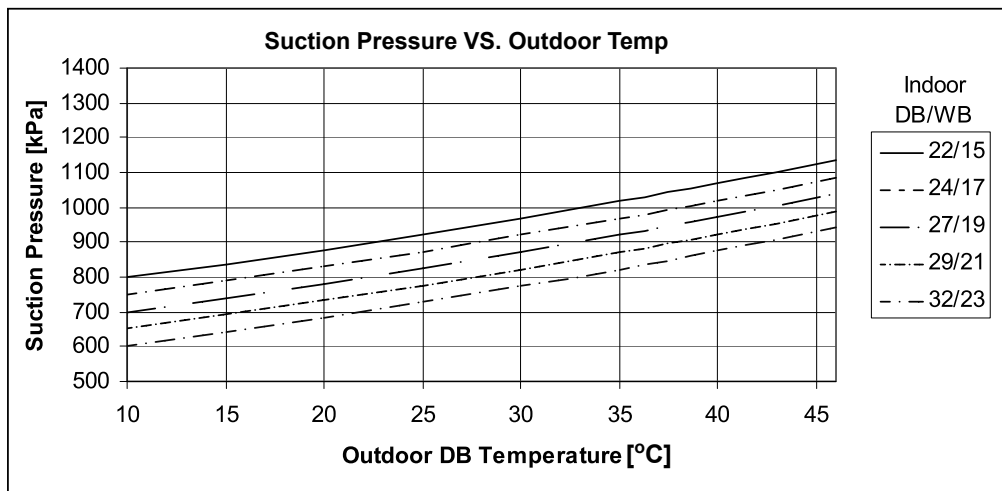


5.9.2 Heating

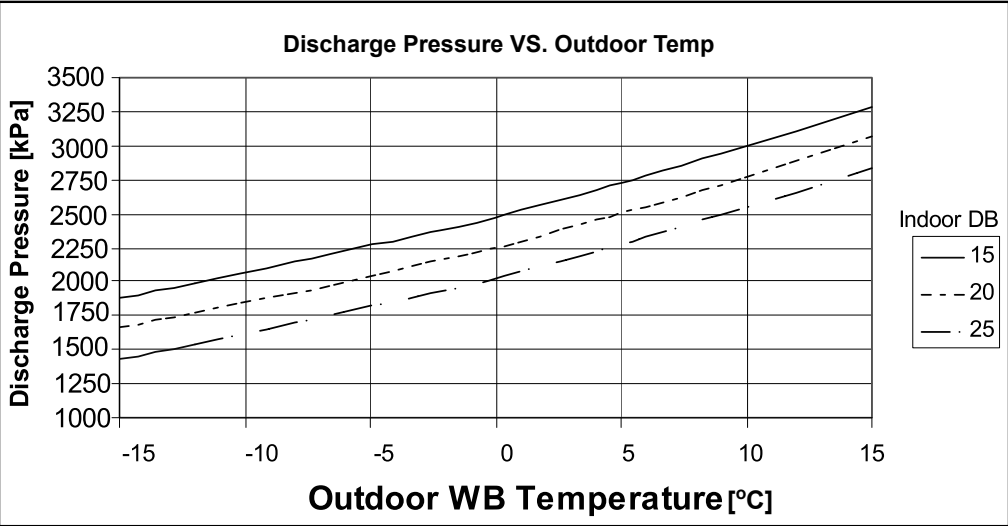
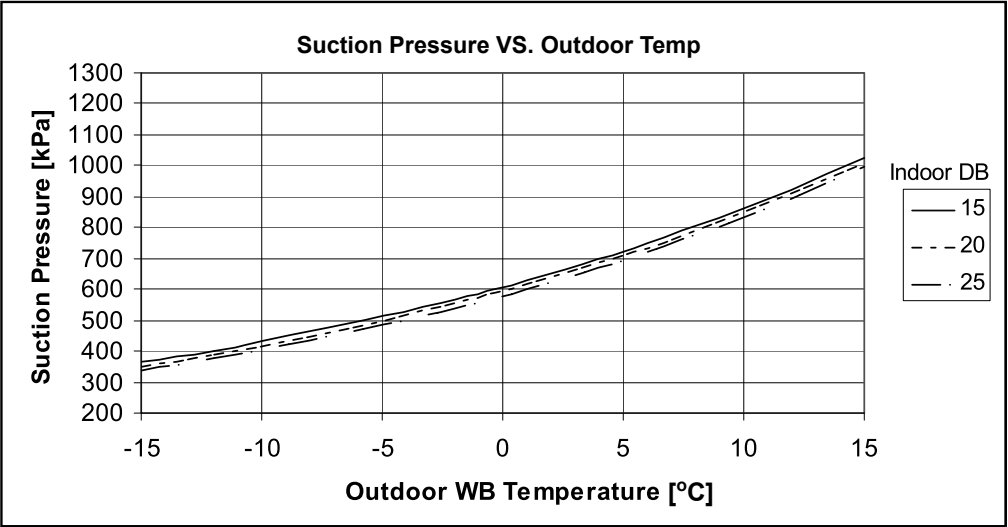


**5.9.3 Model: HAD009 / GC 9 RC DCI**

**5.9.3.1 Cooling**

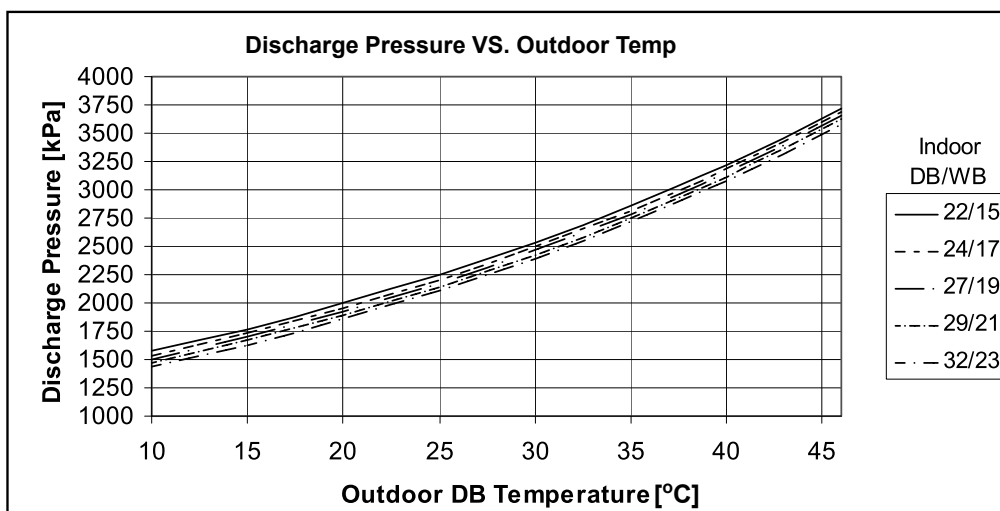
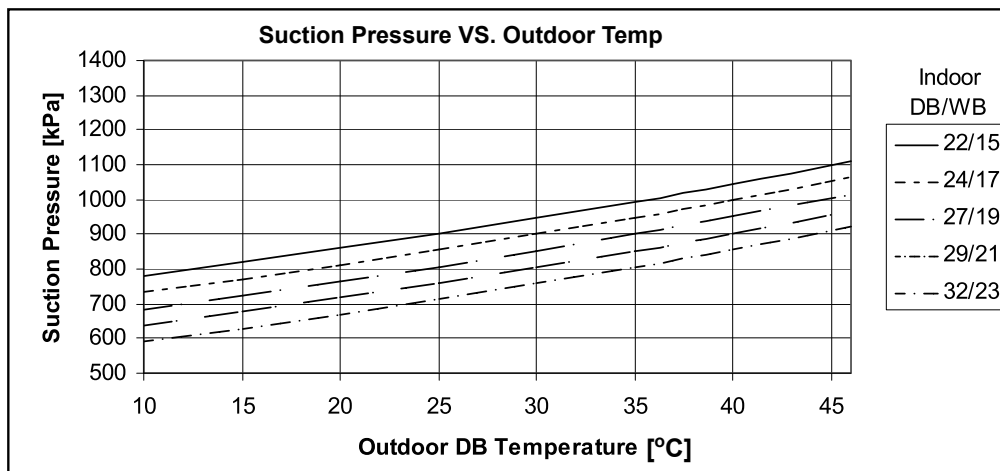


5.9.3.2 Heating

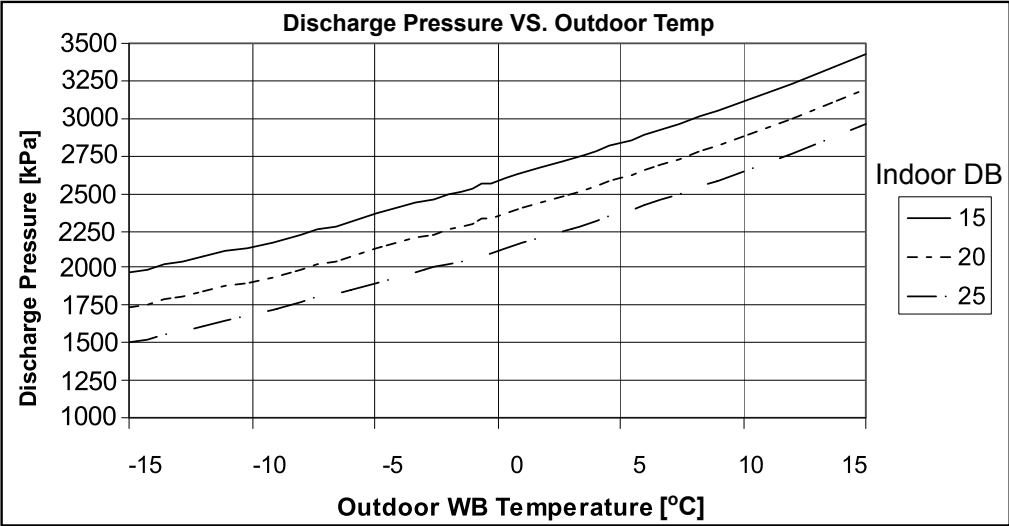
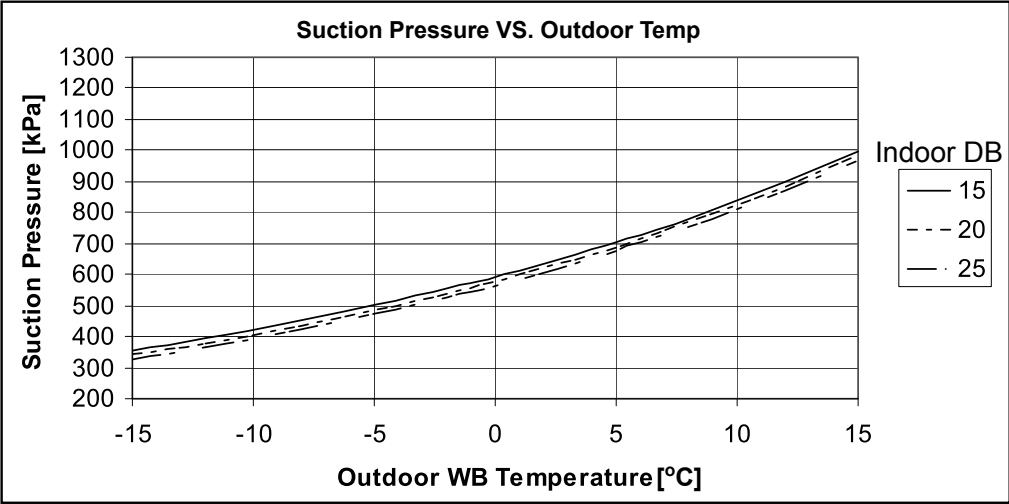


## 5.9.4 Model: HAD012 / GC 12 RC DCI

### 5.9.4.1 Cooling



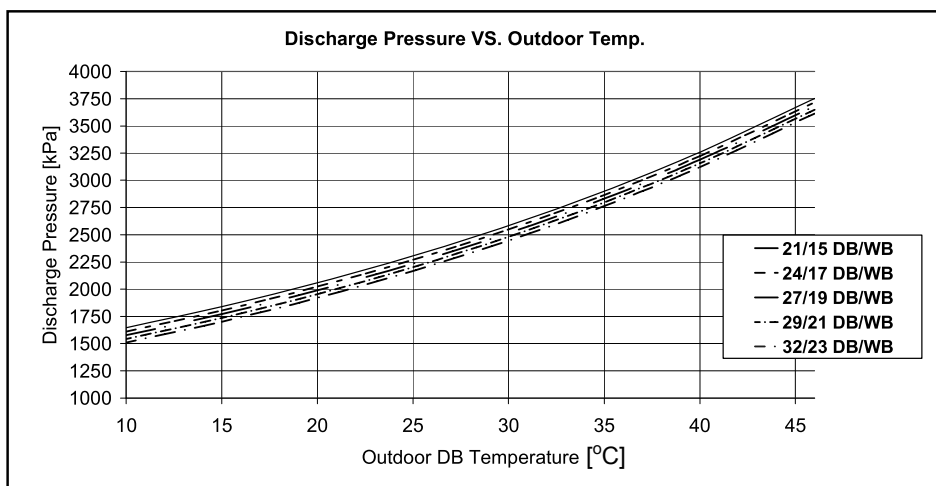
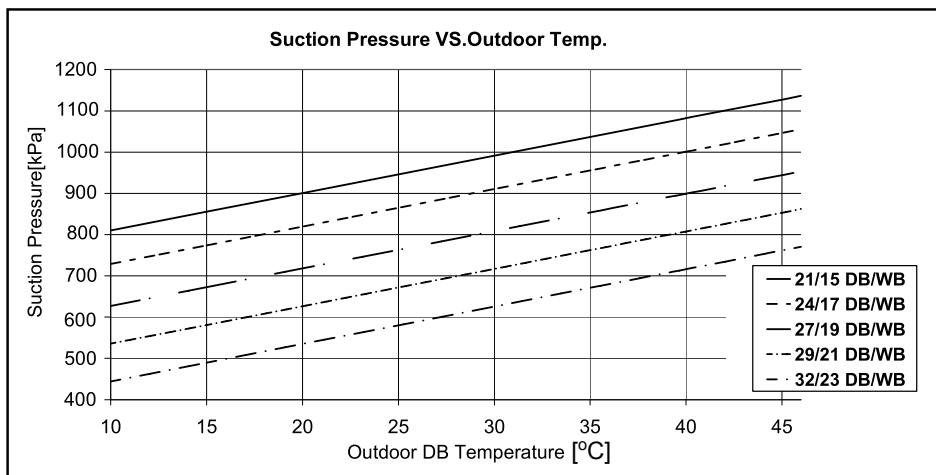
5.9.4.2 Heating



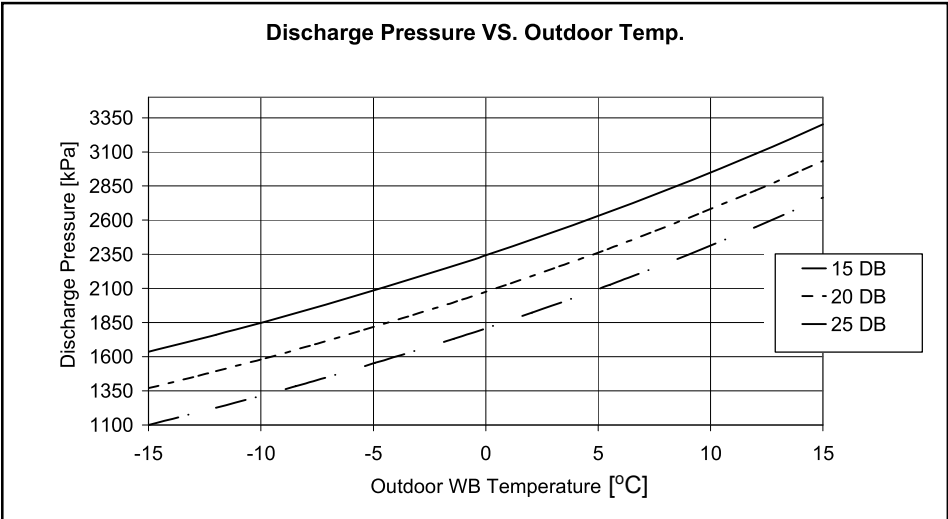
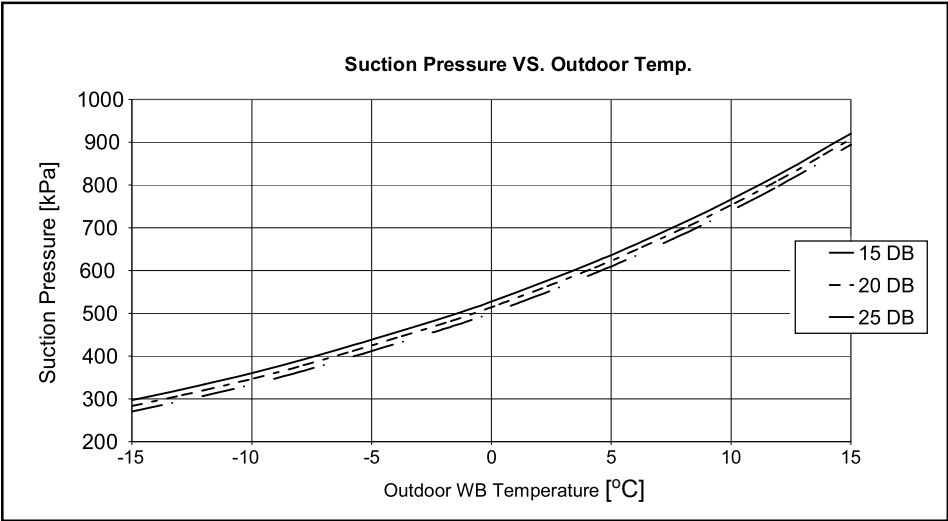


## 5.9.5 Model: HAD009 / GCD009

### 5.9.5.1 Cooling

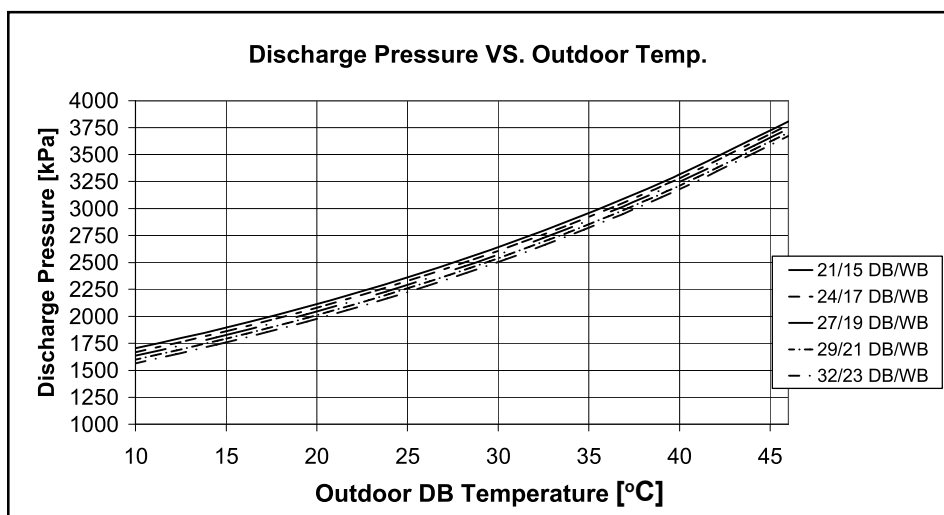
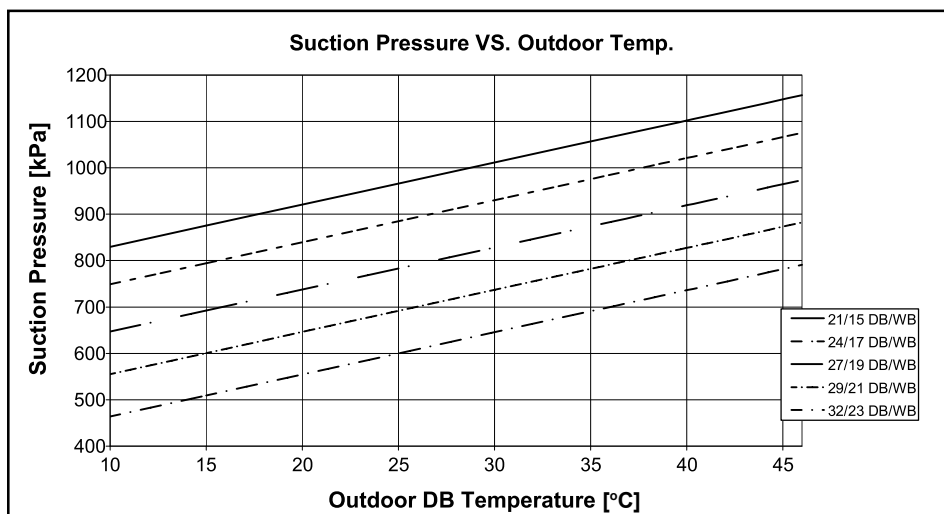


5.9.5.2 Heating

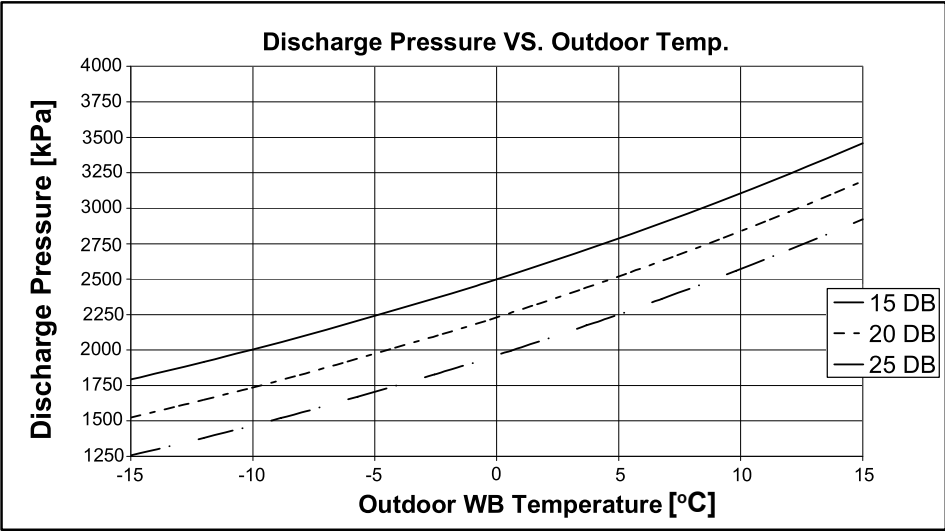
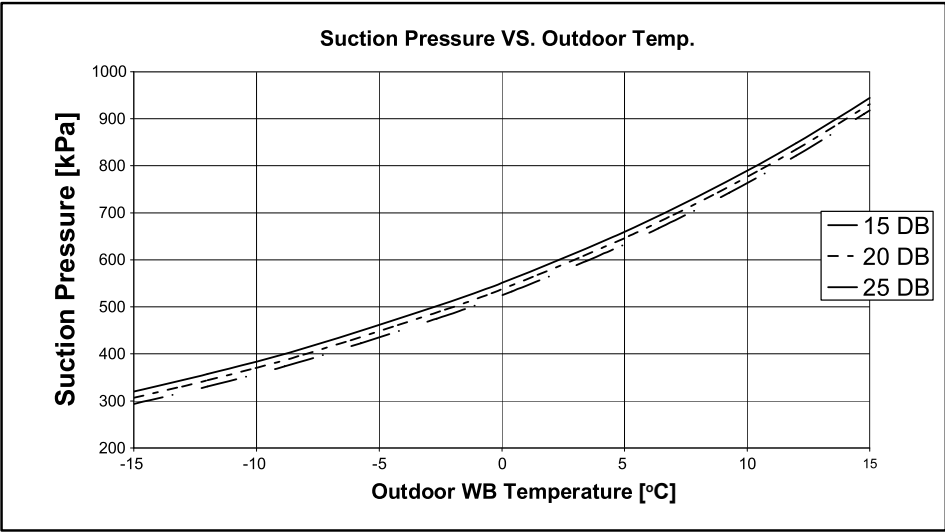


## 5.9.6 Model: HAD012 / GCD012

### 5.9.6.1 Cooling

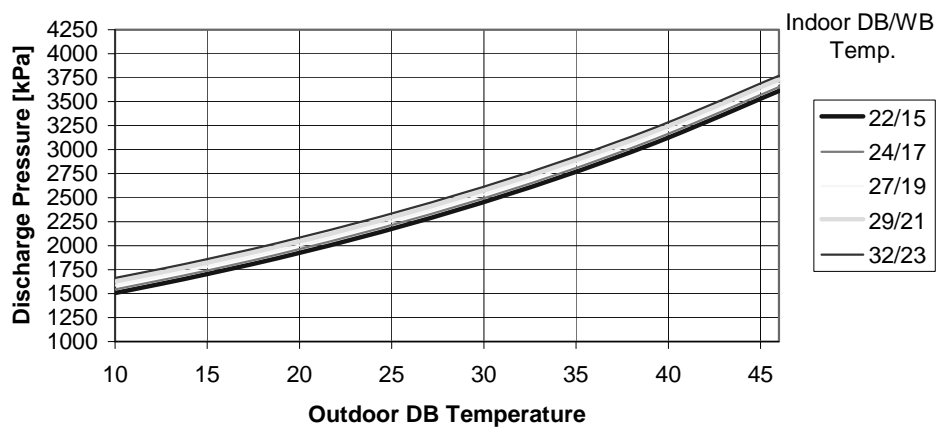
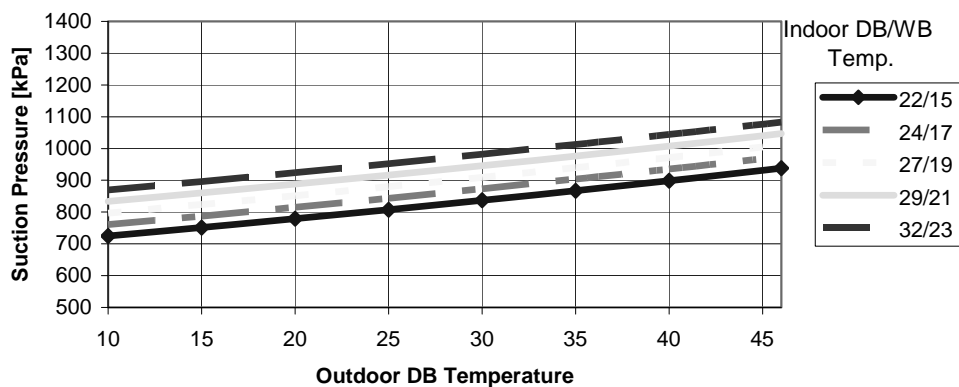


5.9.6.2 Heating

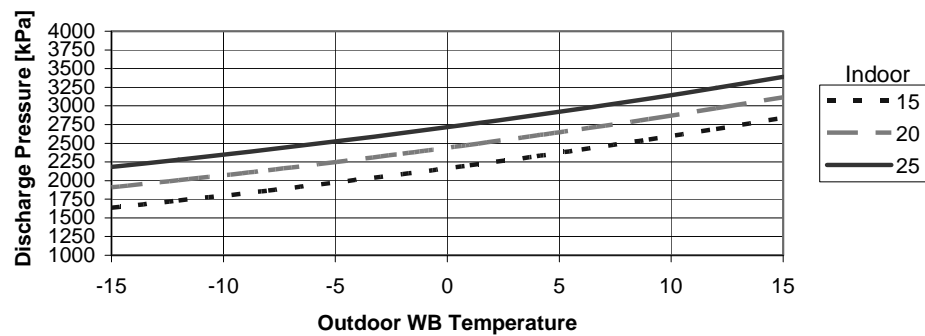
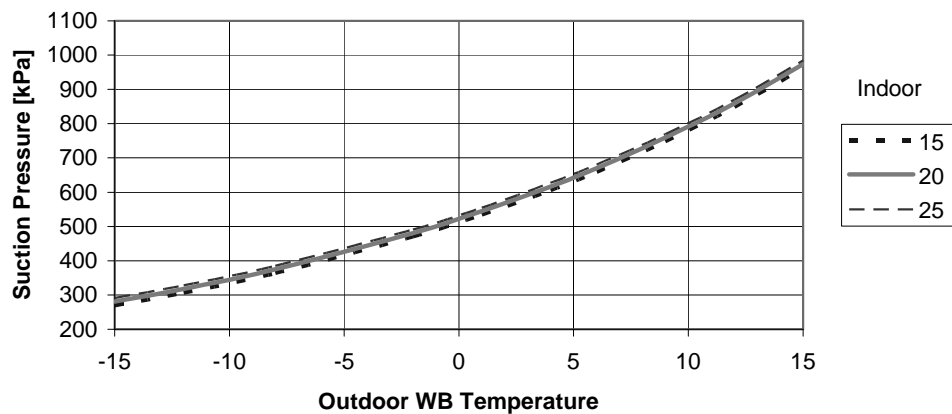


**5.9.7 Model: HAD018 / GC 18**

**5.9.7.1 Cooling**

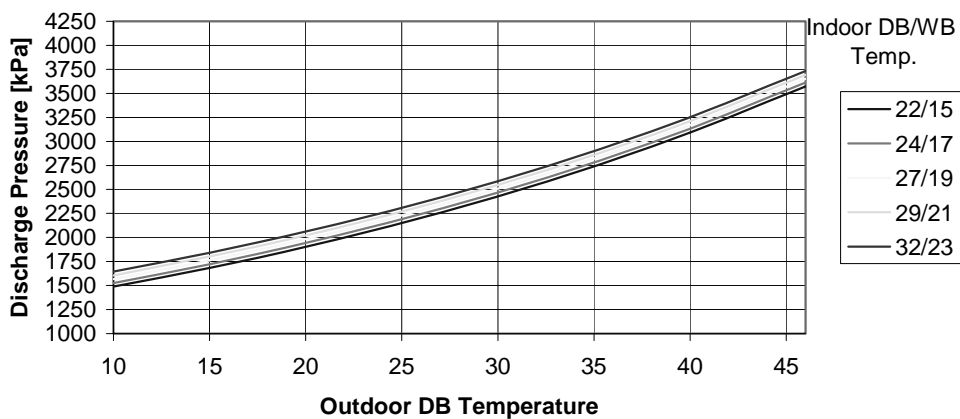
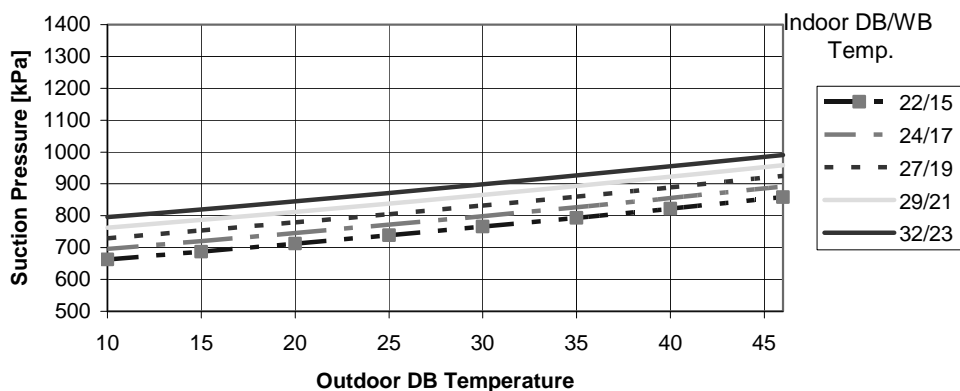


5.9.7.2 Heating

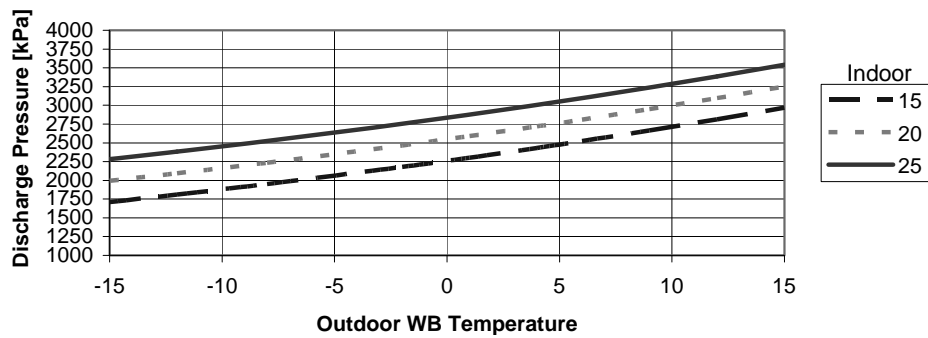
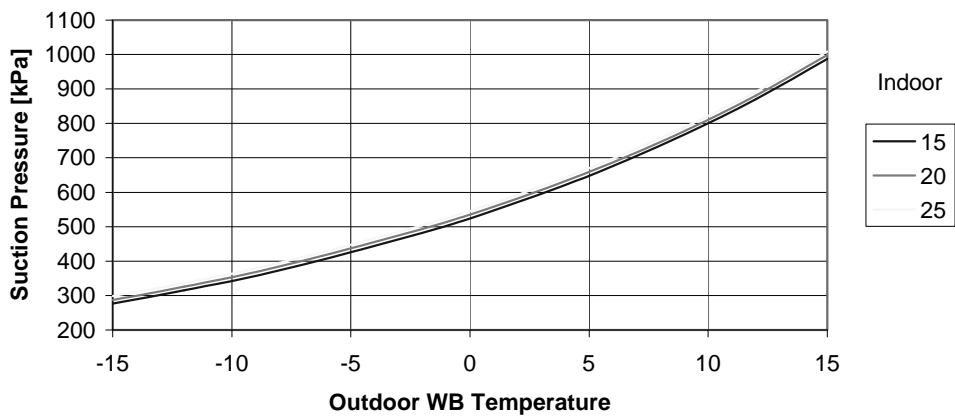


**5.9.8 Model: HAD022 / GC 22**

**5.9.8.1 Cooling**



5.9.8.2 Heating

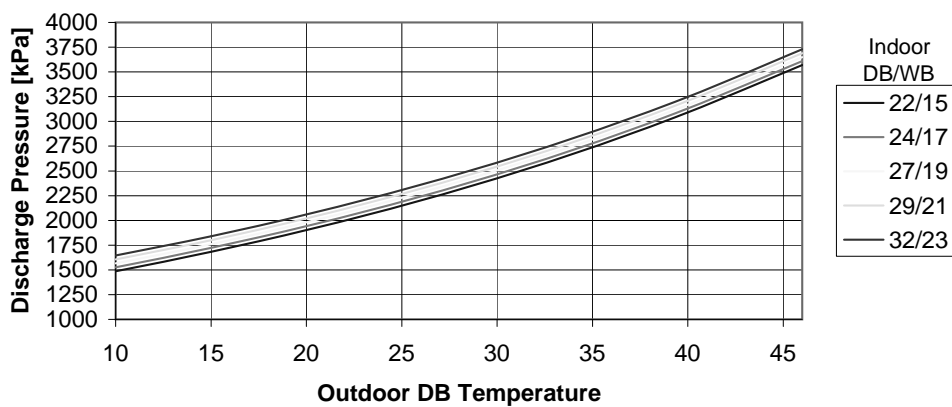
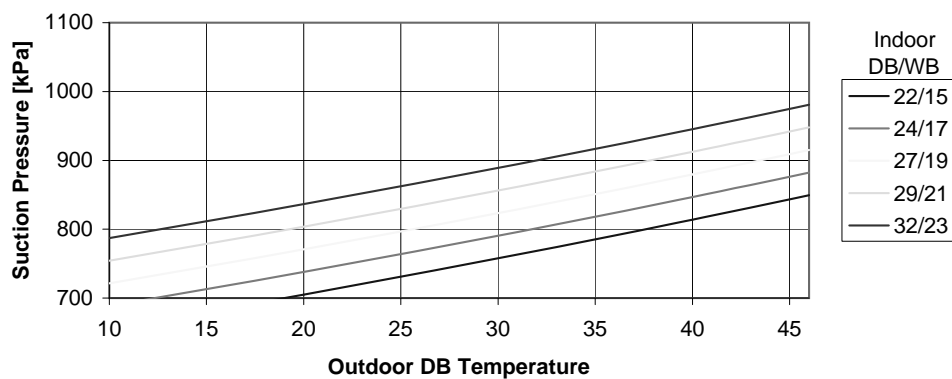




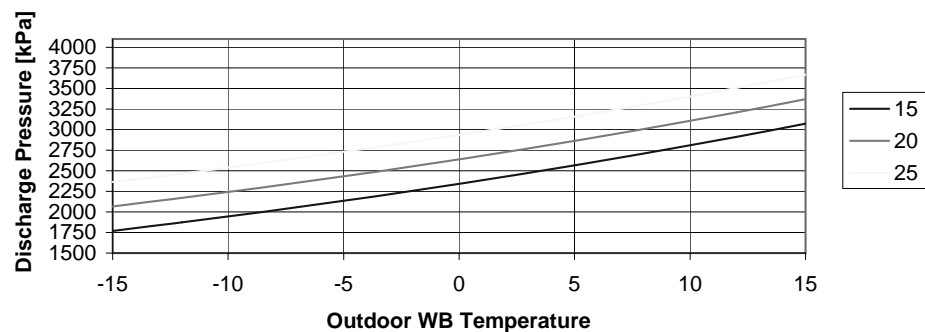
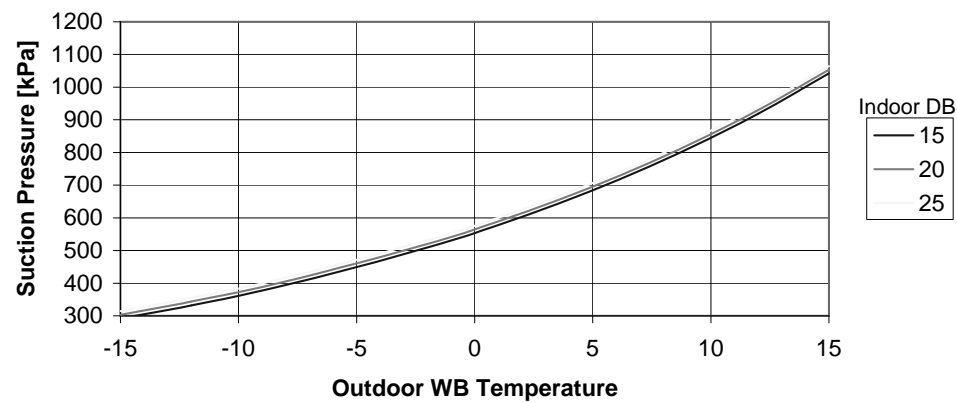
## 5.9.9 Model: HAD024 / GC 24

### 5.9..1 Cooling

#### 6.3.1 Cooling-Test Mode



5.9.9.2 Heating



## 6. SOUND LEVEL CHARACTERISTICS

### 6.1 Sound Pressure Level

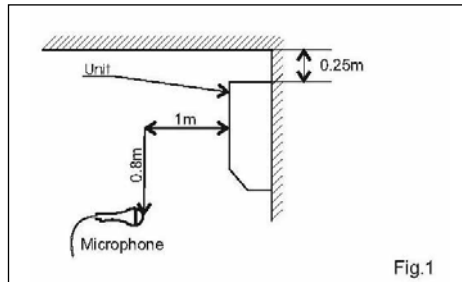
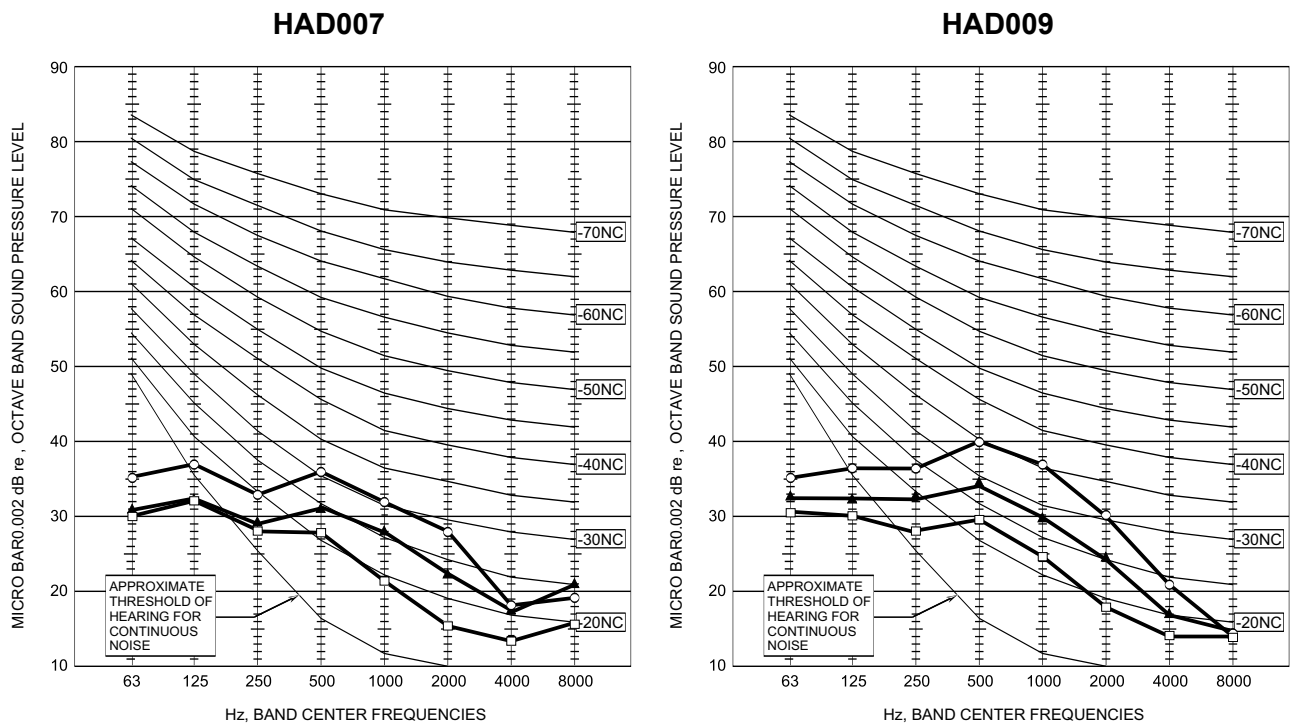


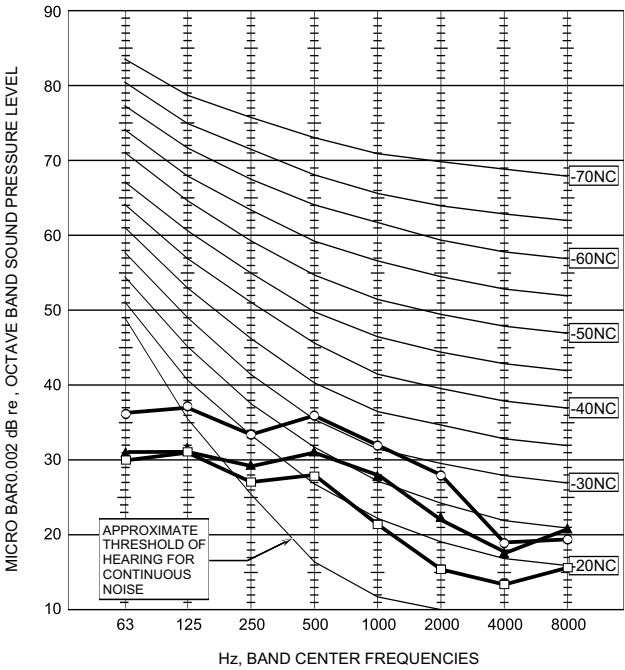
Figure 1. Wall Mounted

### 6.2 Sound Pressure Level Spectrum (Measured as Figure 1)

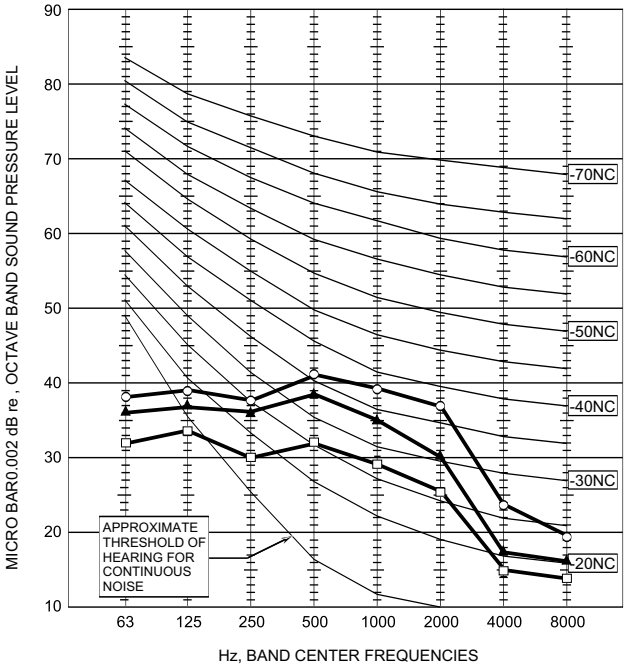


| FAN SPEED | LINE |
|-----------|------|
| HI        | —○—  |
| ME        | —▲—  |
| LO        | —□—  |

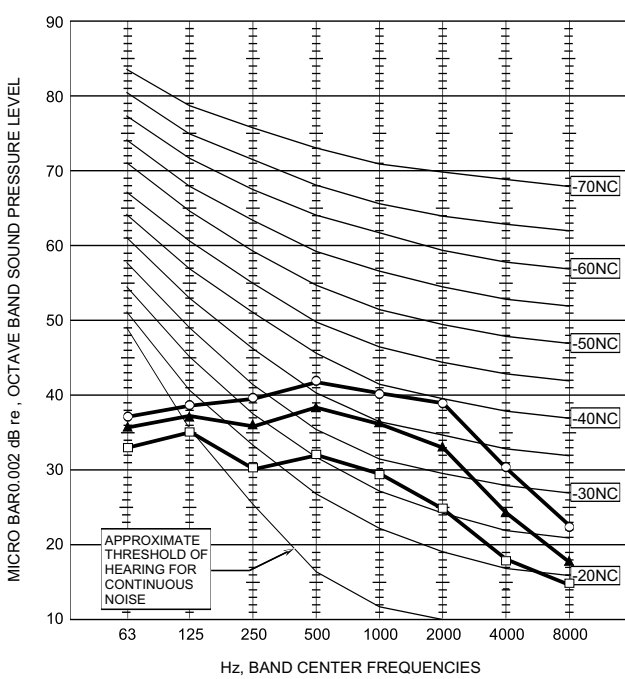
HAD0012



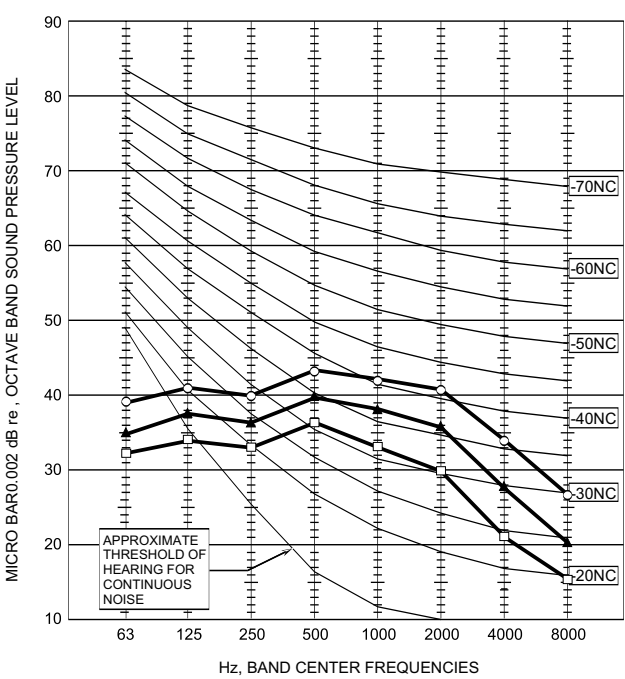
HAD0018



HAD022



HAD024



### 6.3 Outdoor units

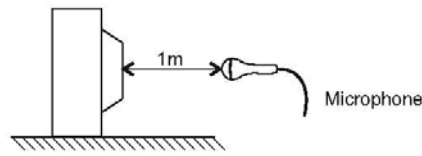
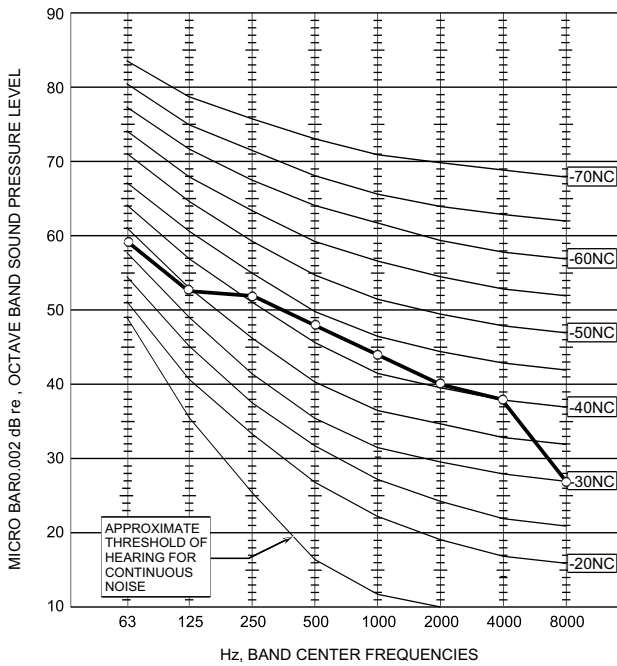


Fig.5

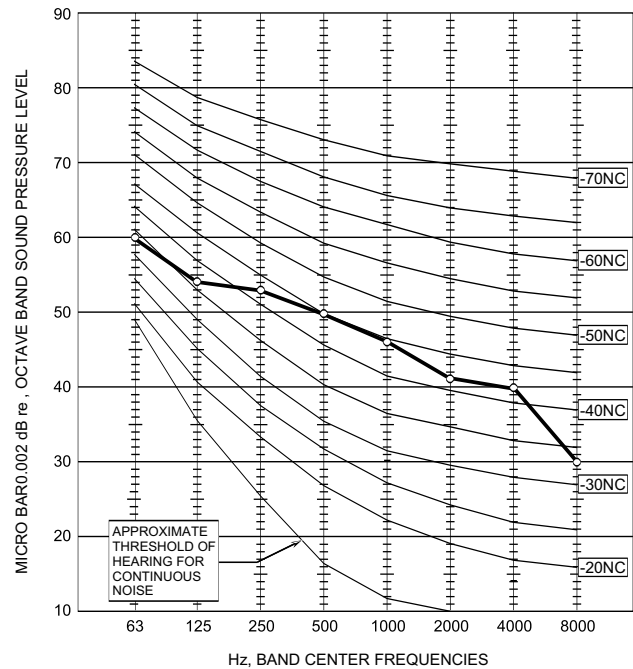
Microphone Distance from Unit

### 6.4 Sound Pressure Level Spectrum (Measured as Figure 5)

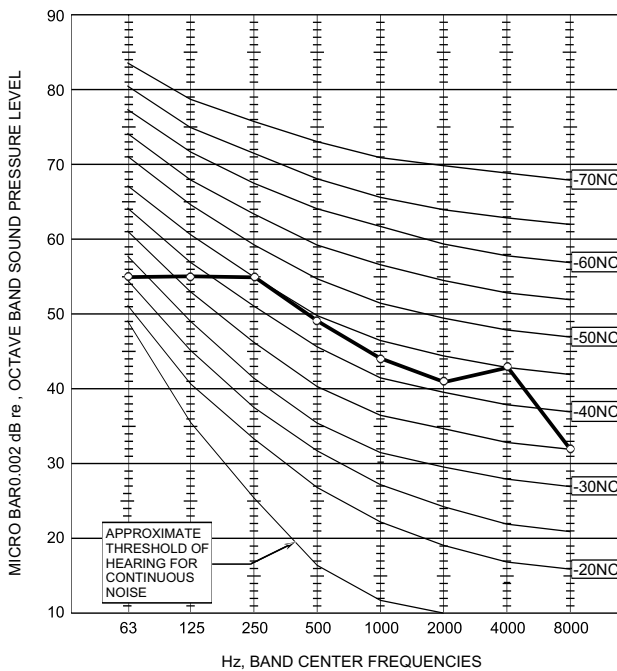
**GC 7 RC DCI Cooling**



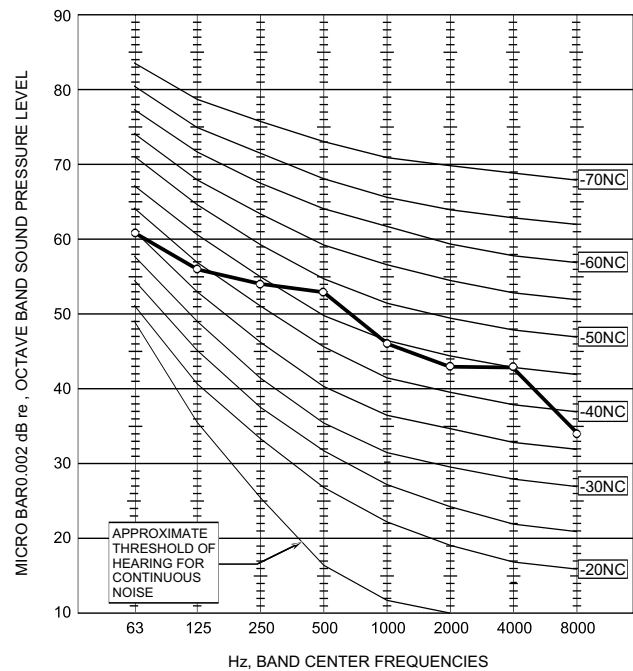
**GC 7 RC DCI Heating**



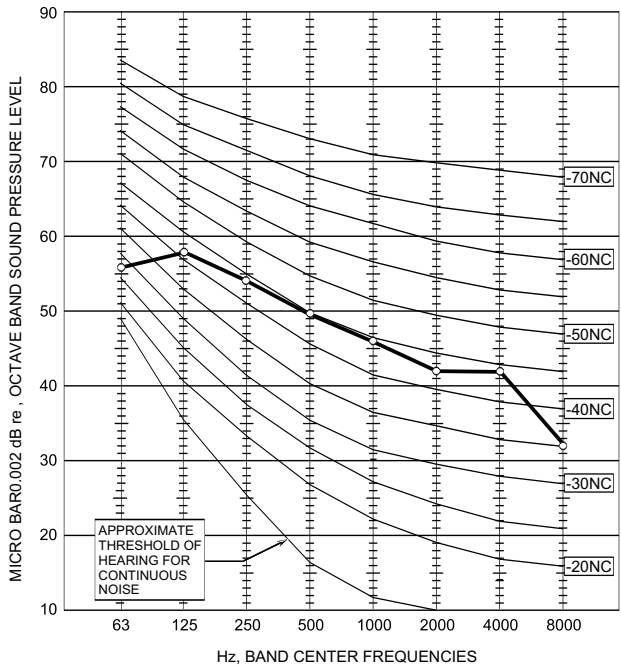
**GC 9 RC DCI Cooling**



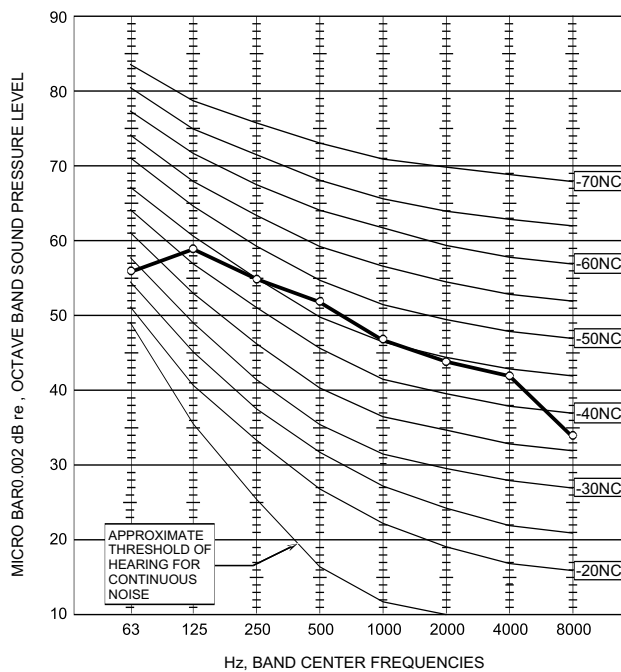
**GC 9 RC DCI Heating**



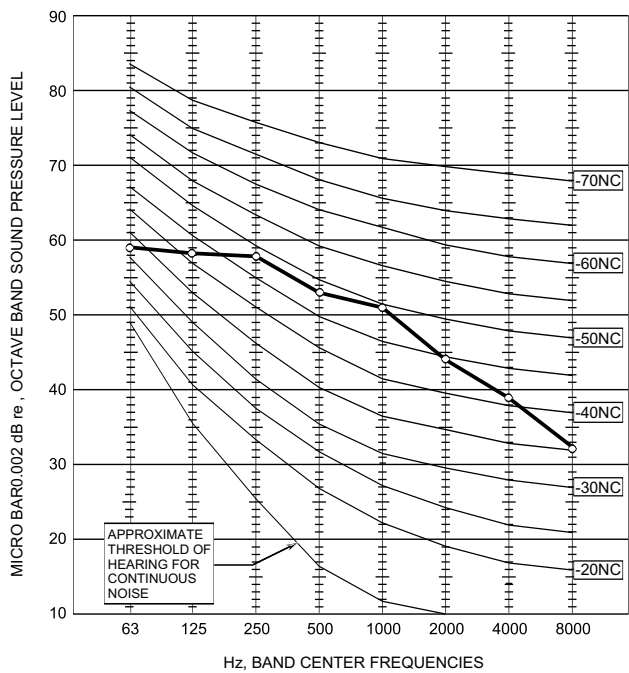
GC 12 RC DCI Cooling



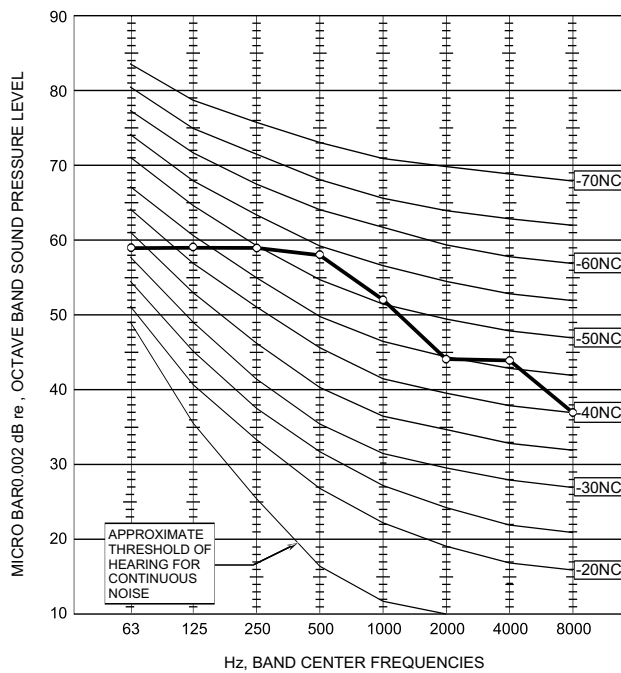
GC 12 RC DCI Heating



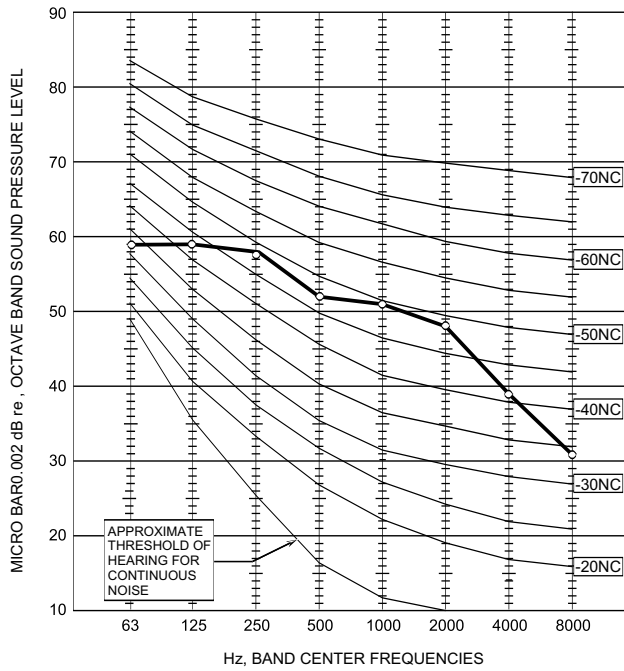
GCD009 Cooling



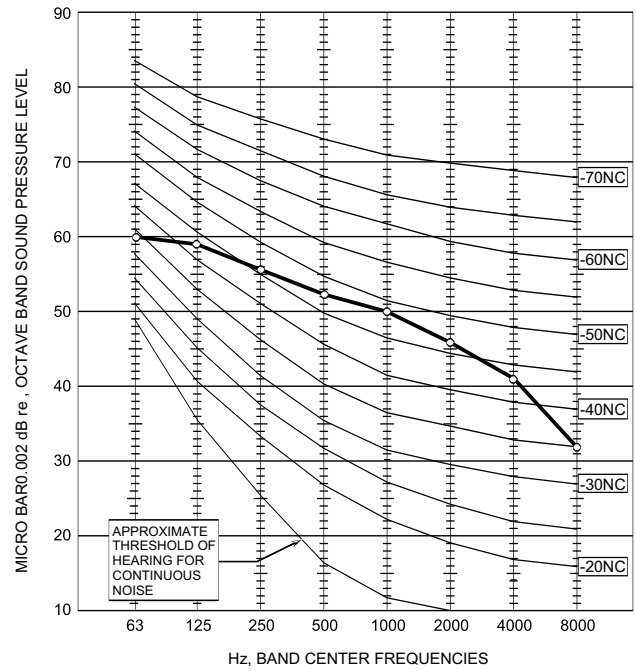
GCD009 Heating



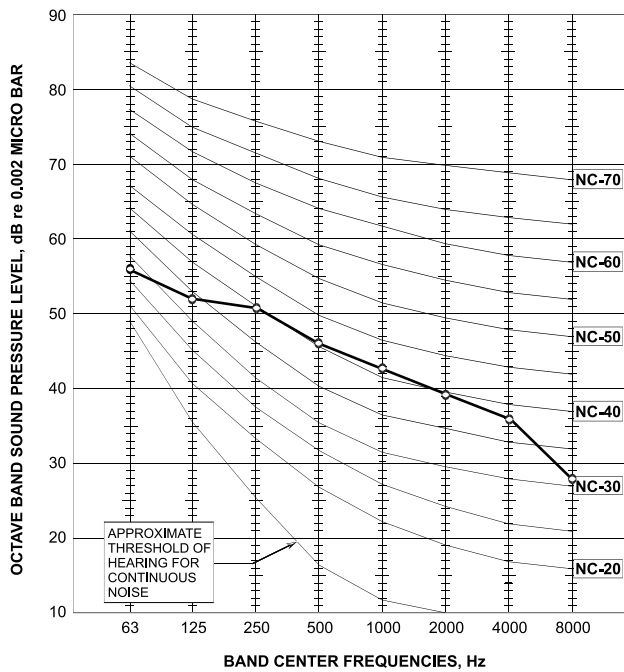
**GCD012 Cooling**



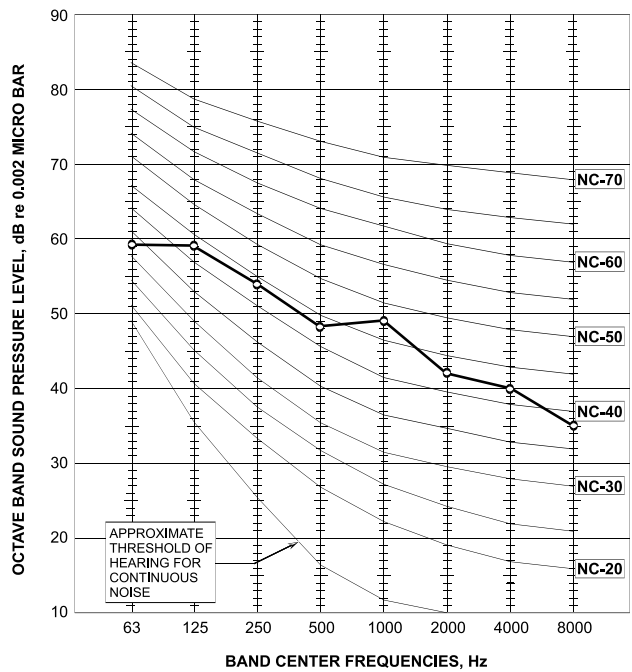
**GCD012 Heating**



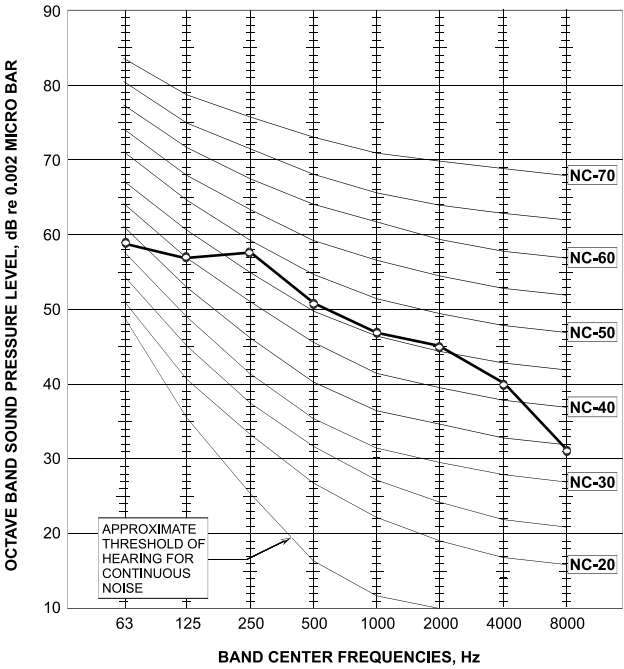
**GC 18 Cooling**



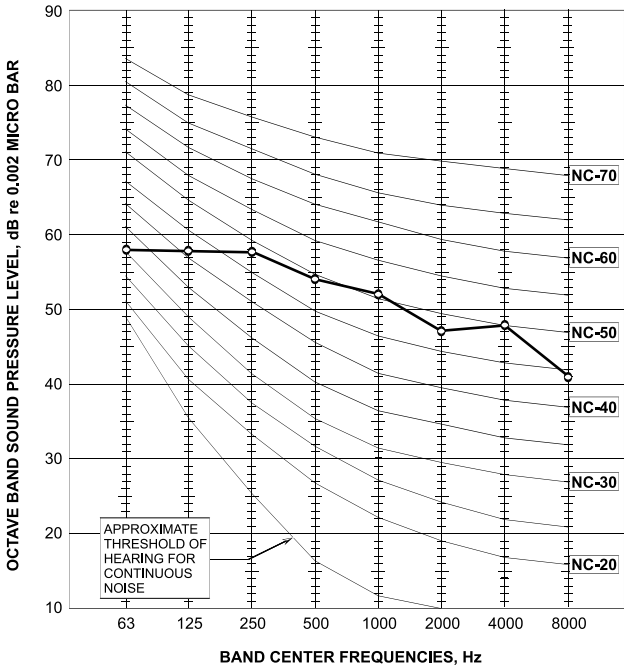
**GC 18 Heating**



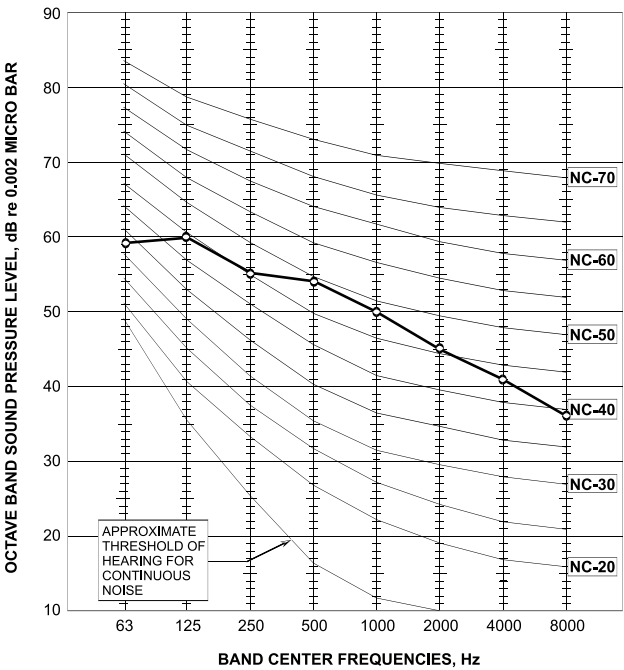
GC 21 Cooling



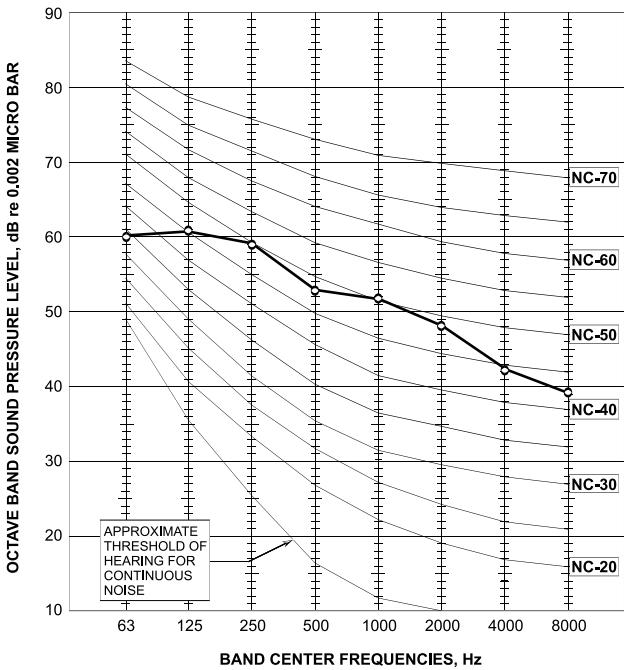
GC 21 Heating



GC 24 Cooling



GC 24 Heating





## 7. ELECTRICAL DATA

### 7.1 Single Phase Units

| MODEL  | HAD007                | HAD009                | HAD012                |
|--|-----------------------|-----------------------|-----------------------|
| Power Supply   | To indoor             | To indoor             | To indoor             |
|  | 1PH,220-240V,50Hz     | 1PH,220-240V,50Hz     | 1PH,220-240V,50Hz     |
| Max Current, A   | 5.2                   | 6.3                   | 7.5                   |
| Circuit Breaker,A  | 10                    | 10                    | 15                    |
| Power Supply Wiring No. X Cross Section mm <sup>2</sup>            | 3x1.0 mm <sup>2</sup> | 3x1.0 mm <sup>2</sup> | 3x1.5 mm <sup>2</sup> |
| Interconnecting Cable RC Model No. X Cross Section mm <sup>2</sup> | 4x1.0 mm <sup>2</sup> | 4x1.0 mm <sup>2</sup> | 5x1.5 mm <sup>2</sup> |

| MODEL   | HAD018/GC 18         | HAD022/GC 21         | HAD024/GC 24         |
|---|----------------------|----------------------|----------------------|
| Power Supply  | 1PH-230V-50Hz        | 1PH-230V-50Hz        | 1PH-230V-50Hz        |
| Power Supply From                                       | Indoor Unit          | Indoor Unit          | Outdoor Unit         |
| Max Current(A)  | 10.5                 | 10.5                 | 15                   |
| Start Current(A)  | 10.5                 | 10.5                 | 15                   |
| Inrush Current(A)                                       | 45                   |                      |                      |
| Circuit Breaker(A)                                      | 20                   | 20                   | 20                   |
| Power Supply Cord No.×Cross section mm <sup>2</sup>     | 3×2.5mm <sup>2</sup> | 3×2.5mm <sup>2</sup> | 3×2.5mm <sup>2</sup> |
| Interconnecting Cable No.×Cross section mm <sup>2</sup> | 4×2.5mm <sup>2</sup> | 4×2.5mm <sup>2</sup> | 4×2.5mm <sup>2</sup> |

***Inrush current is the current when power is up (charging the DC capacitors at outdoor unit controller).***

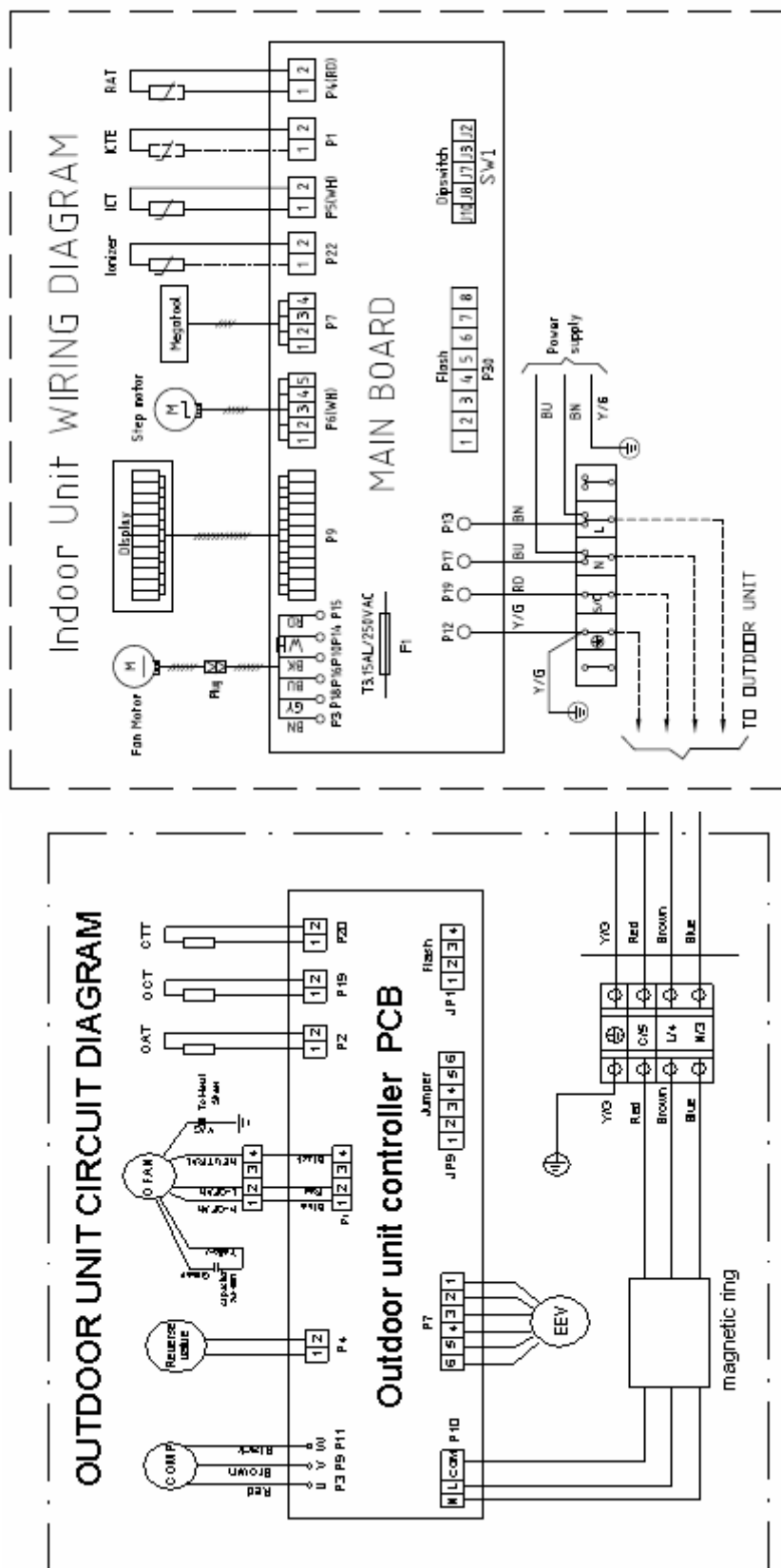
***Starting current is the current when starting the compressor.***

#### NOTE

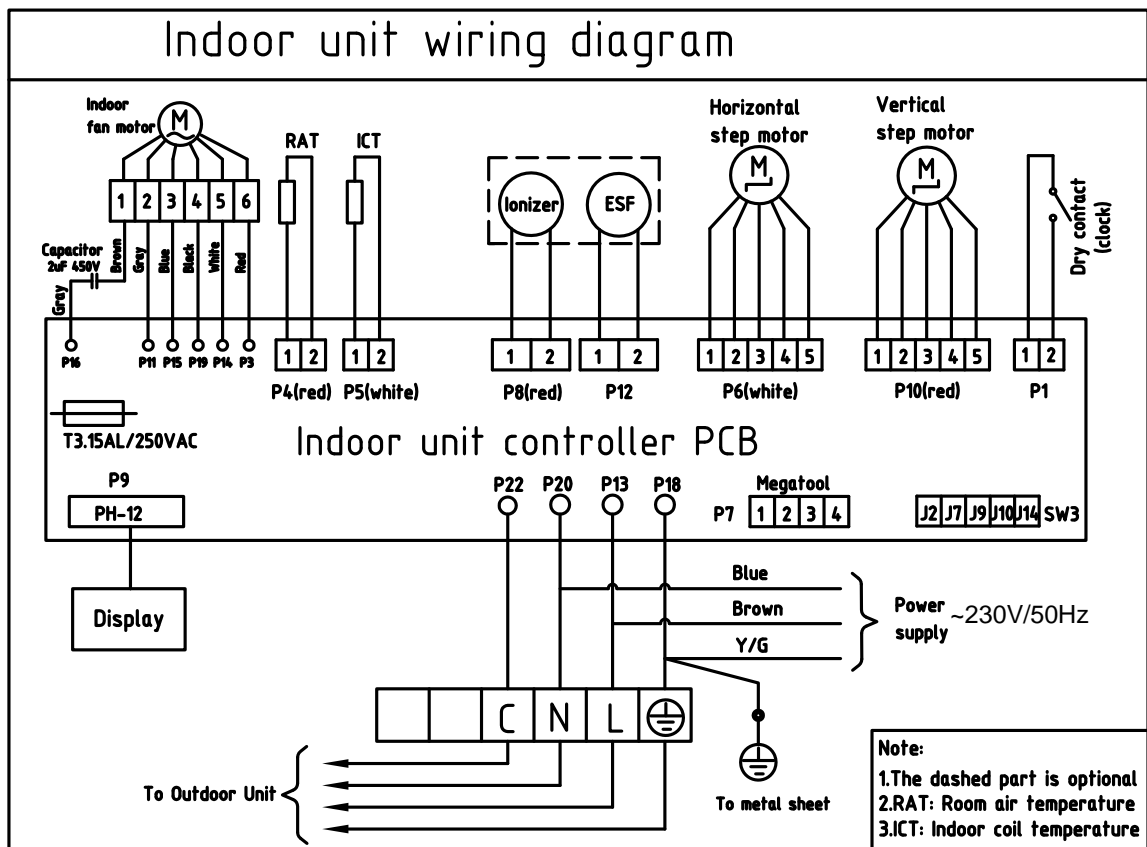
***Power wiring cord should comply with local laws and electrical regulations requirements.***

## 8. WIRING DIAGRAMS

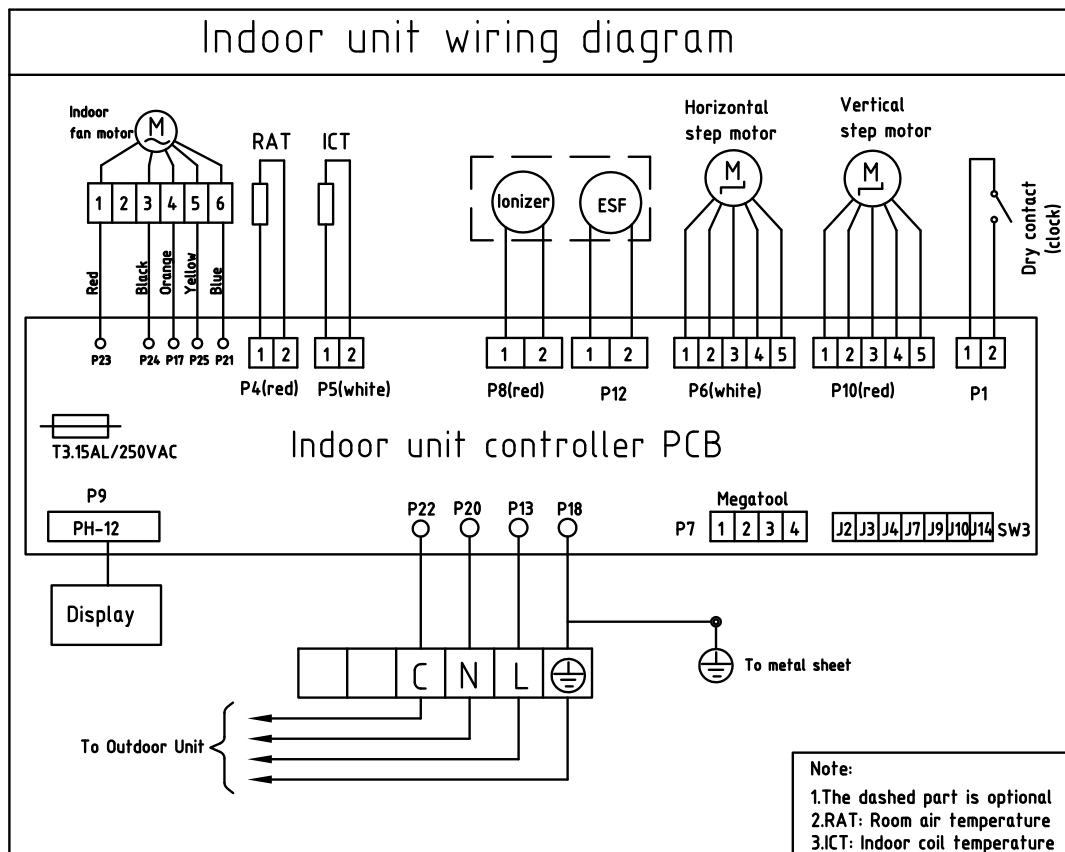
### 8.1 HAD007, HAD009, HAD012 / GC 7, 9, 12 RC / GCD009, GCD012



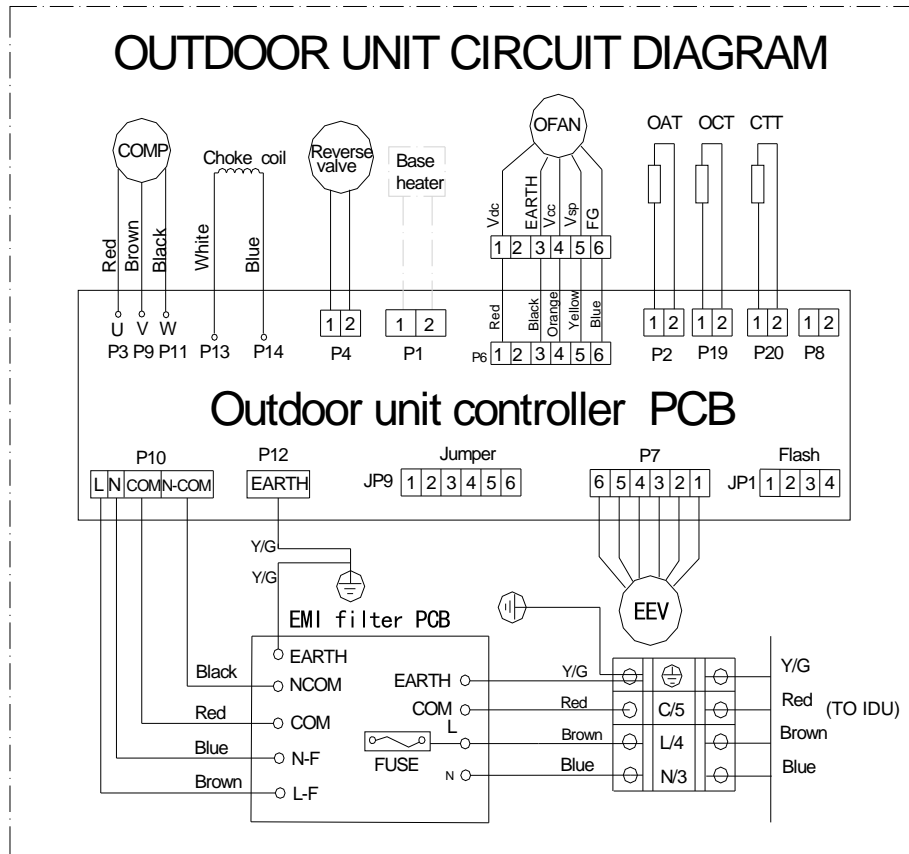
## 8.2 HAD018, HAD022



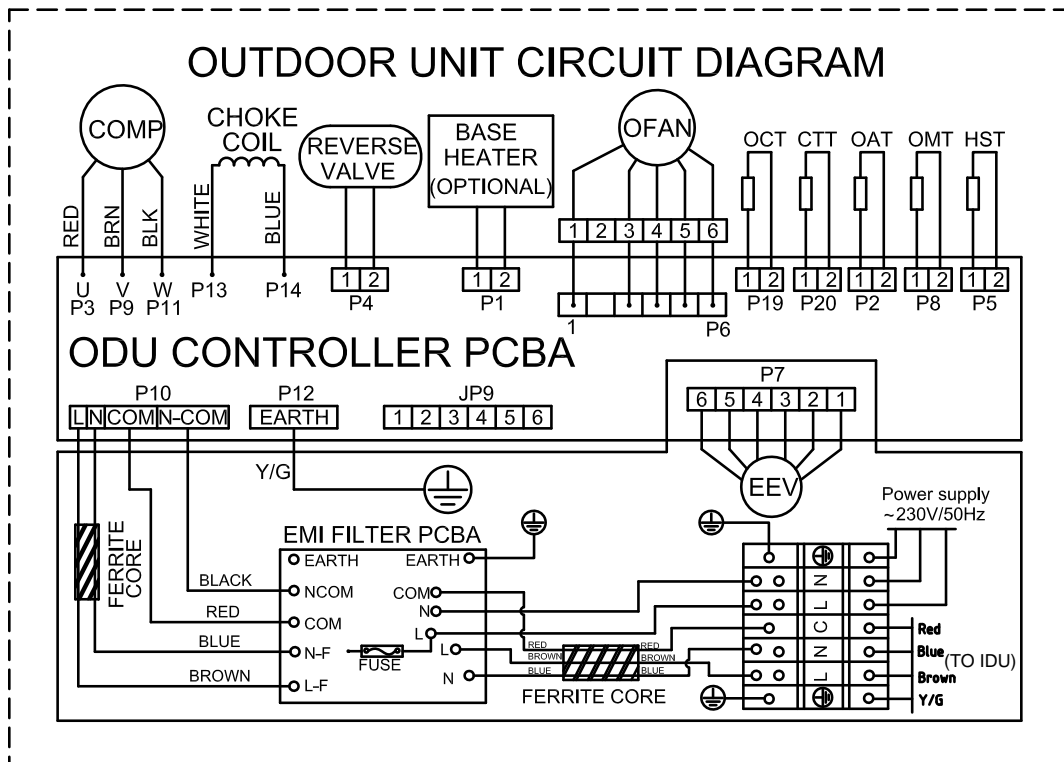
## 8.3 HAD024



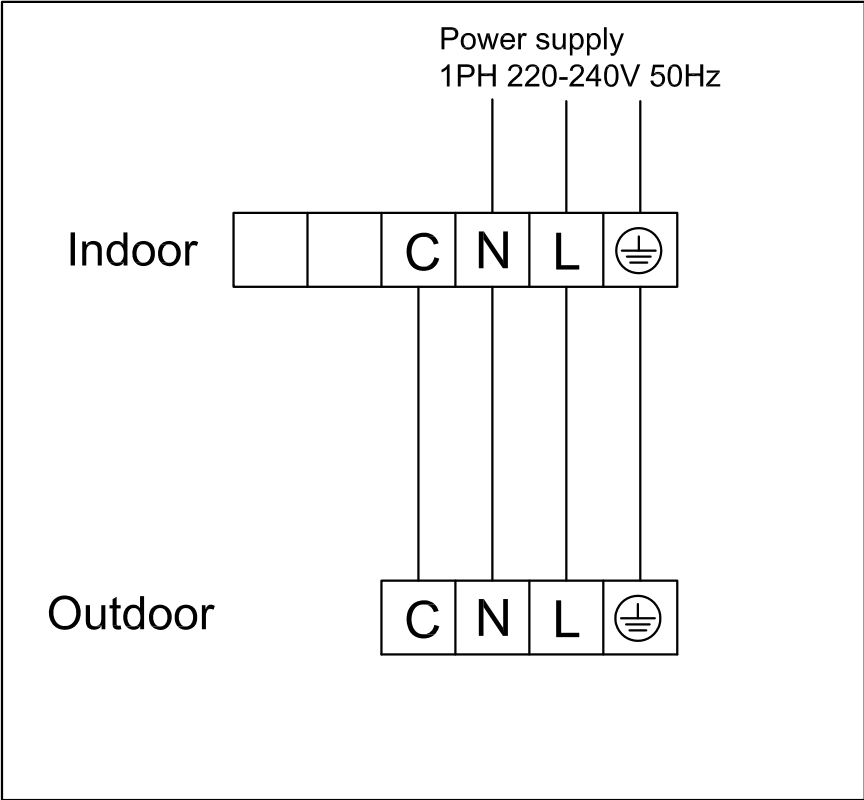
## 8.4 GC 18, GC 21



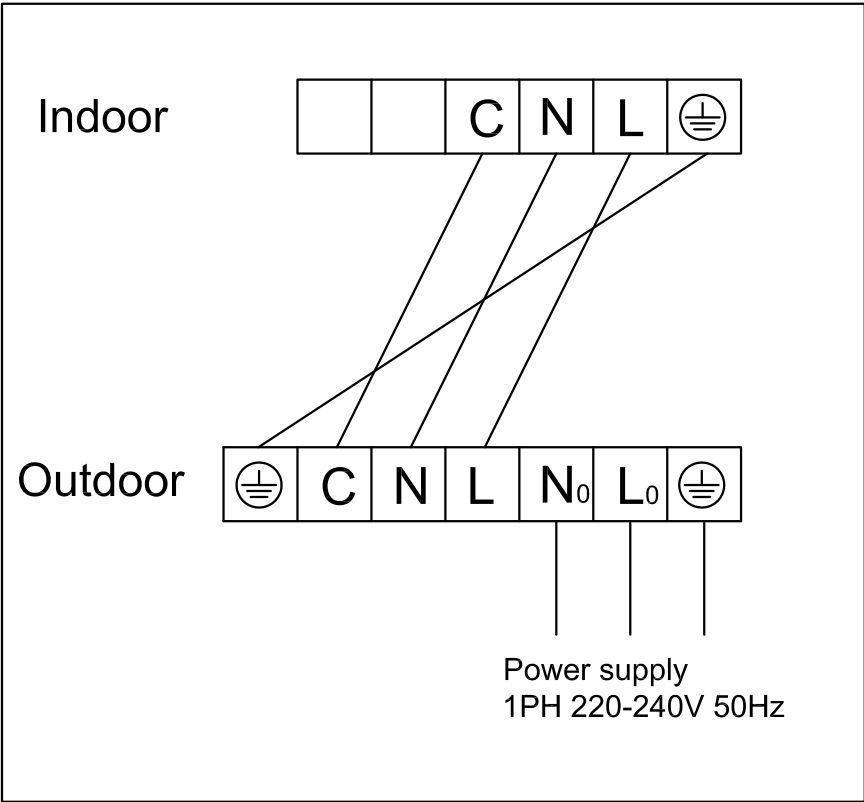
## 8.5 GC 24



8.6 Connection between indoor unit and outdoor unit



Power supply from indoor unit

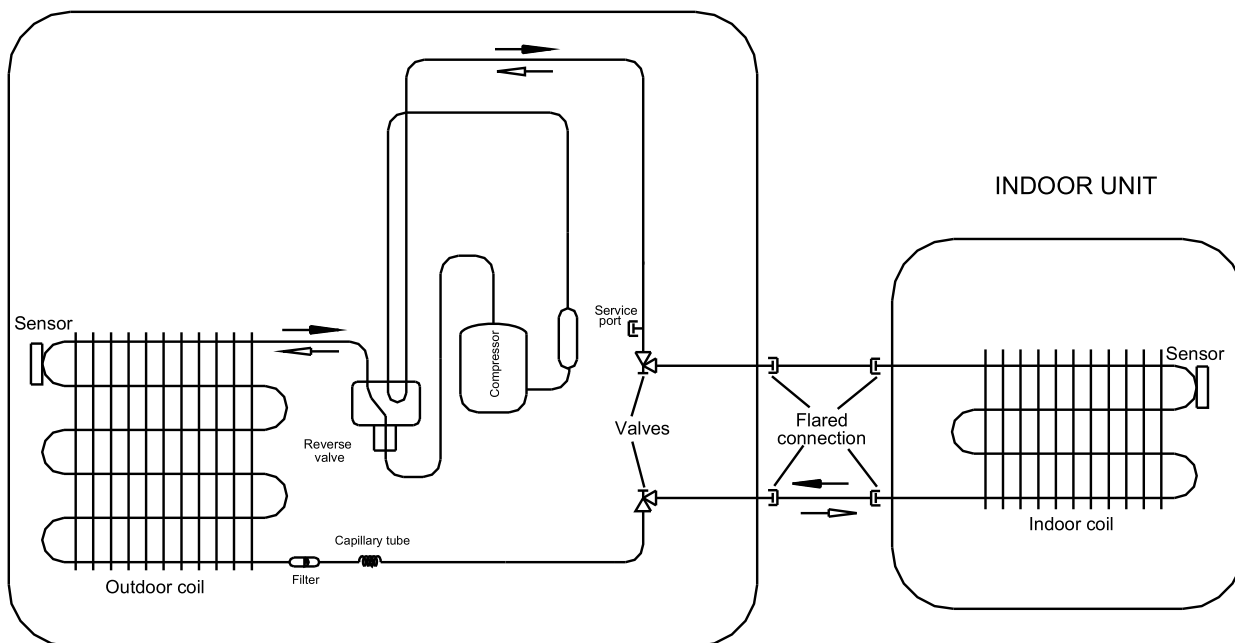


Power supply from outdoor unit

## 9. REFRIGERATION DIAGRAMS

### 9.1 HAD009 Matching GCD009

OUTDOOR UNIT

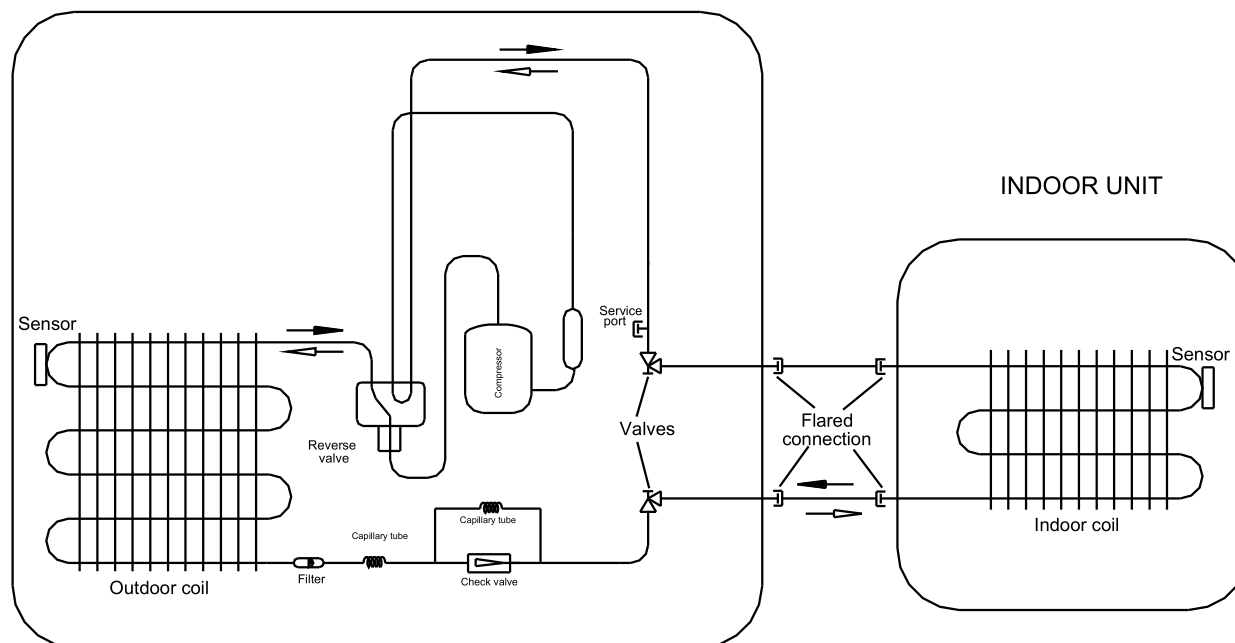


→ Heating

→ Cooling

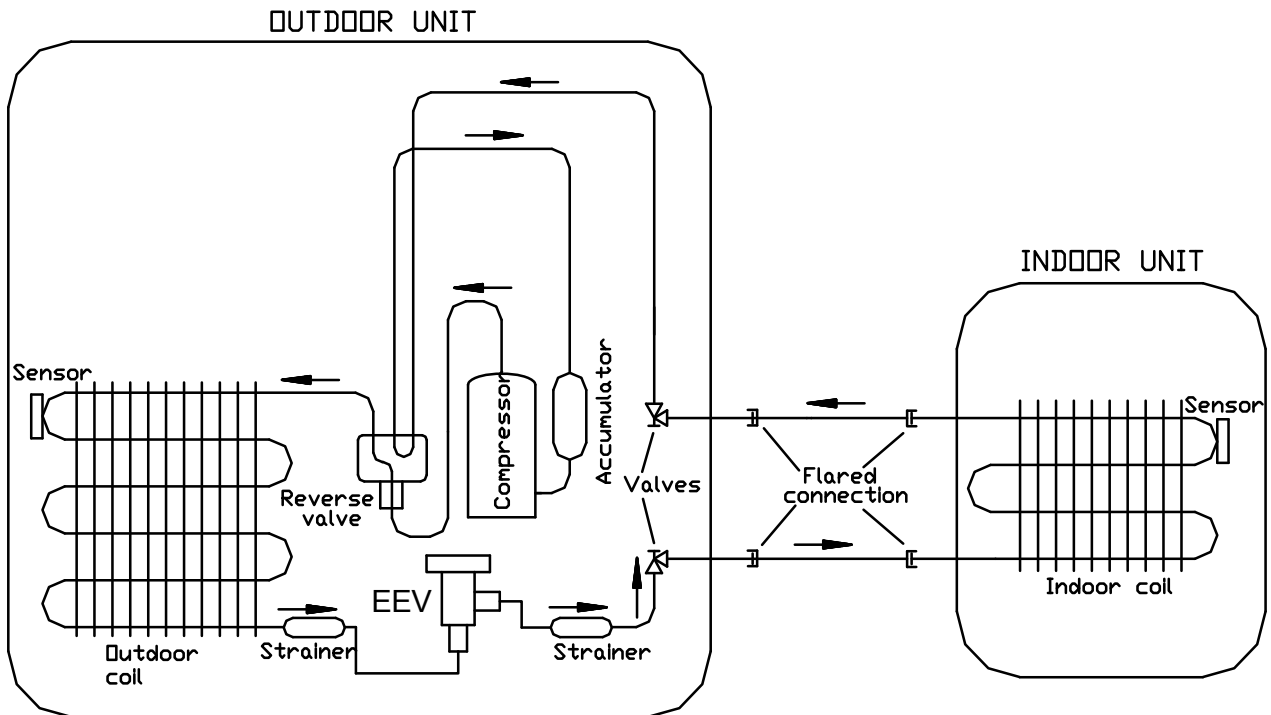
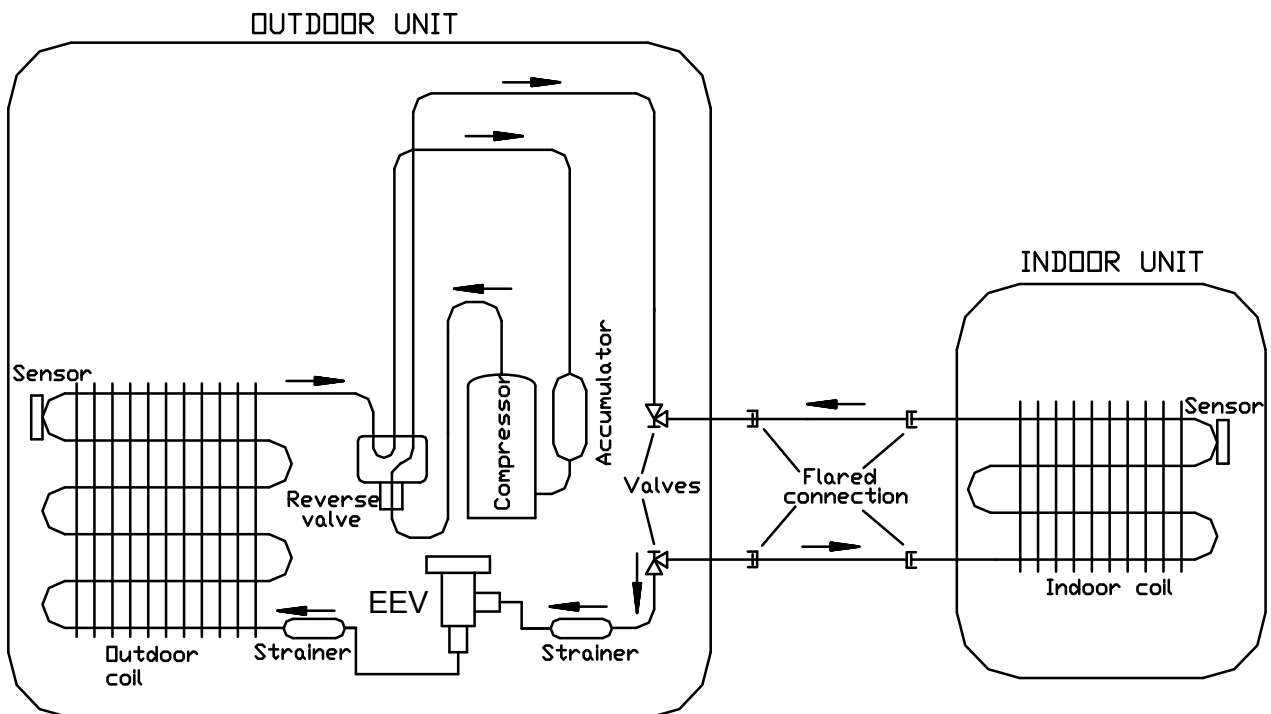
### 9.2 HAD012 Matching GCD012

OUTDOOR UNIT



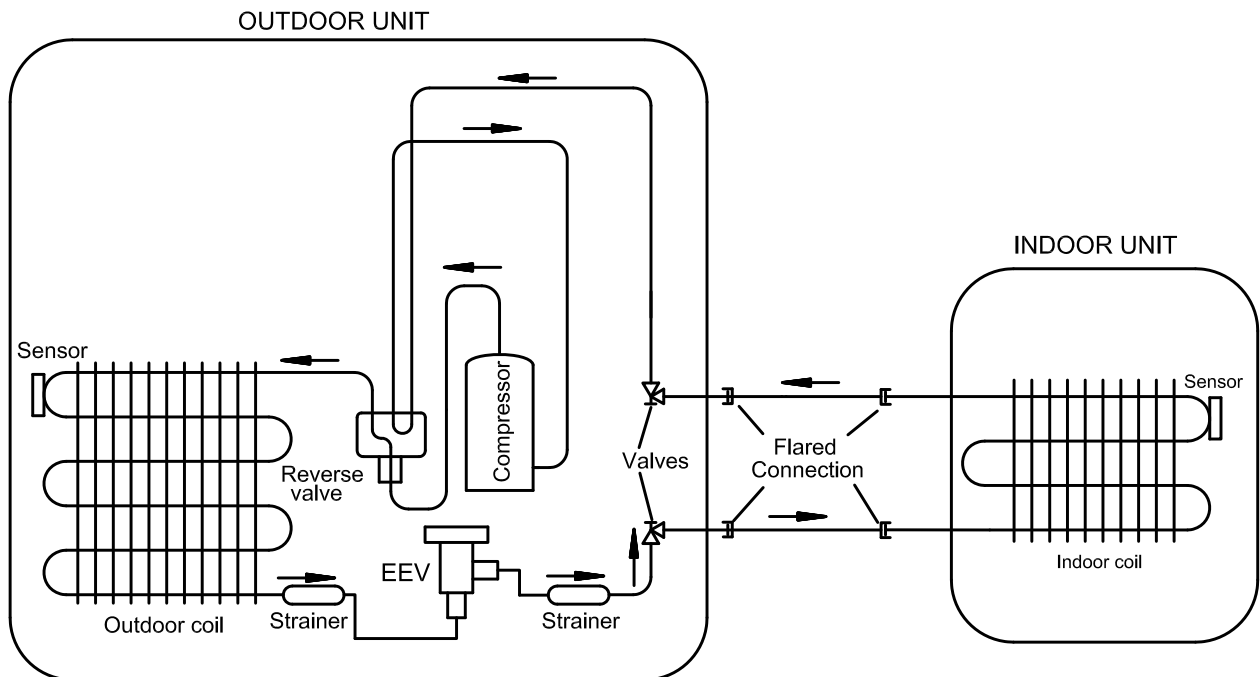
→ Heating

→ Cooling

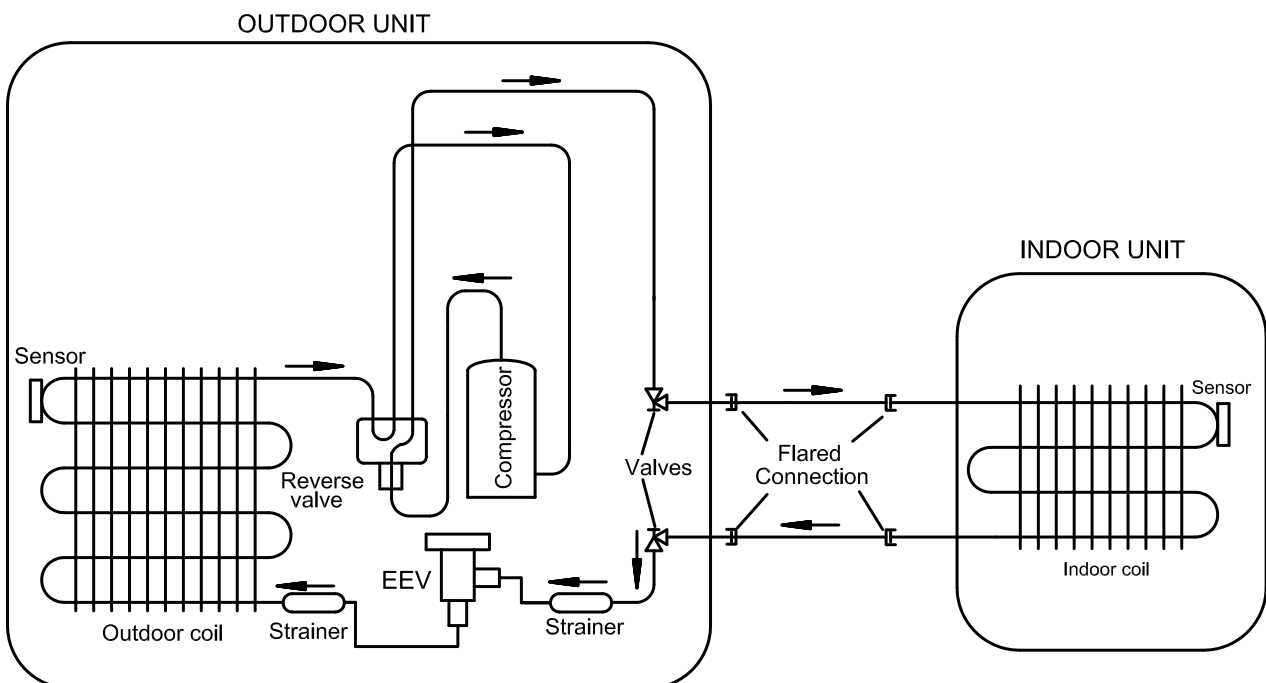
**9.3 HAD007, HAD009, HAD012 Matching GC 7, GC 9, GC 12 RC DCI****COOLING & DRY MODE****HEATING MODE**

## 9.4 HAD018, HAD022, HAD024 Matching GC 18, GC 21, GC 24

### Cooling

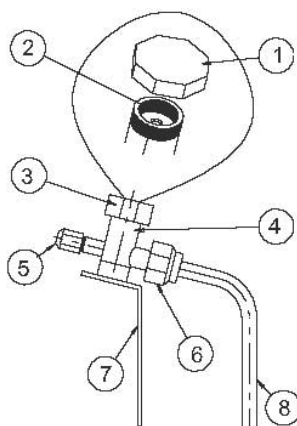
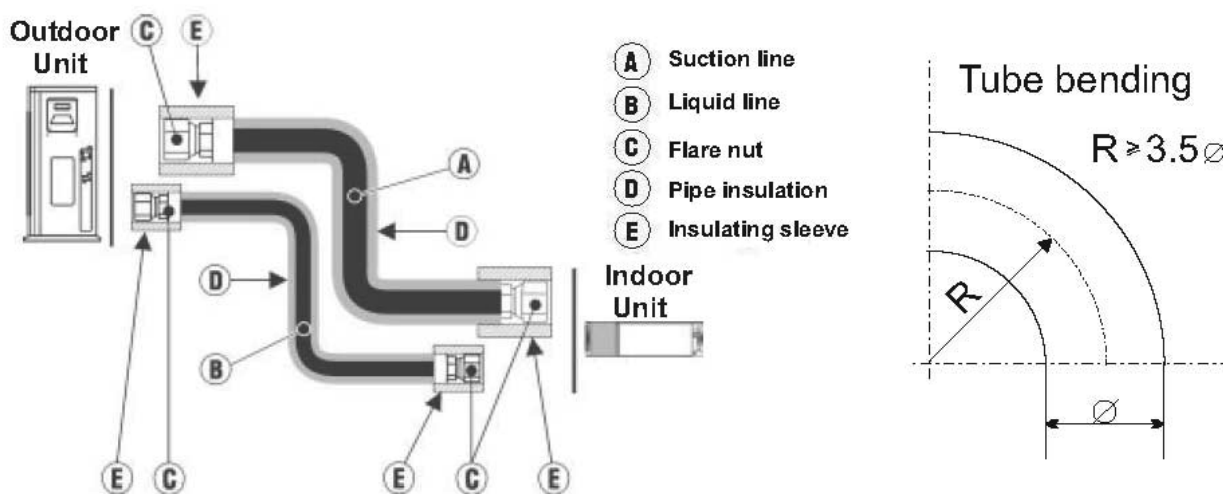


### Heating





## 10. TUBING CONNECTIONS



| TUBE (Inch)      | 1/4"  | 3/8"  | 1/2"  | 5/8"  | 3/4"  |
|------------------|-------|-------|-------|-------|-------|
| TORQUE (Nm)      |       |       |       |       |       |
| Flare Nuts       | 11-13 | 40-45 | 60-65 | 70-75 | 80-85 |
| Valve Cap        | 13-20 | 13-20 | 18-25 | 18-25 | 40-50 |
| Service Port Cap | 11-13 | 11-13 | 11-13 | 11-13 | 11-13 |

1. Valve Protection Cap-end
2. Refrigerant Valve Port (use Allen wrench to open/close)
3. Valve Protection Cap
4. Refrigerant Valve
5. Service Port Cap
6. Flare Nut
7. Unit Back Side
8. Copper Tube

## 11. CONTROL SYSTEM [HAD007, HAD009, HAD012]

### 11.1 Electronic Control

#### 11.1.1 General Functions and Operating Rules

The DCI software is fully parametric.

The parameters values are given in the last section of this control logic chapter of the service manual.

#### 11.1.2 System Operation Concept

The control function is divided between indoor and outdoor unit controllers. Indoor unit is the system 'Master', requesting the outdoor unit for cooling/heating capacity supply. The outdoor unit is the system 'Slave' and it must supply the required capacity unless it enters into a protection mode avoiding it from supplying the requested capacity.

**The capacity request is transferred via indoor to outdoor communication, and is represented by a parameter called 'NLOAD'. NLOAD is an integer number with values between 0 and 127, and it represents the heat or cool load felt by the indoor unit.**

#### 11.1.3 Compressor Frequency Control

##### 11.1.3.1 NLOAD setting

The NLOAD setting is done by the indoor unit controller, based on a PI control scheme.

The actual NLOAD to be sent to the outdoor unit controller, is based on the preliminary LOAD calculation, the indoor fan speed, and the power shedding function.

NLOAD limits as a function of indoor fan speed:

| Indoor Fan Speed | Maximum NLOAD Cooling | Maximum NLOAD Heating |
|------------------|-----------------------|-----------------------|
| Low              | Max NLOADIF1C         | 127                   |
| Medium           | Max NLOADIF2C         | 127                   |
| High             | Max NLOADIF3C         | 127                   |
| Turbo            | Max NLOADIF4C         | 127                   |
| Auto             | Max NLOADIF5C         | 127                   |

##### 11.1.3.2 Target Frequency Setting

The compressor target frequency is a function of the NLOAD number sent from the indoor controller and the outdoor air temperature.

Basic Target Frequency Setting:

##### 1. For S/W 37V3 and lower ( For 453031000R Controller):

| NLOAD            | Target Frequency   |
|------------------|--|
| 127              | Maximum frequency  |
| 10 < NLOAD < 127 | Interpolated value between minimum and maximum frequency |
| 10               | Minimum frequency  |
| 0                | Compressor is stopped                                    |

Target frequency limits as a function of outdoor air temperature (OAT):

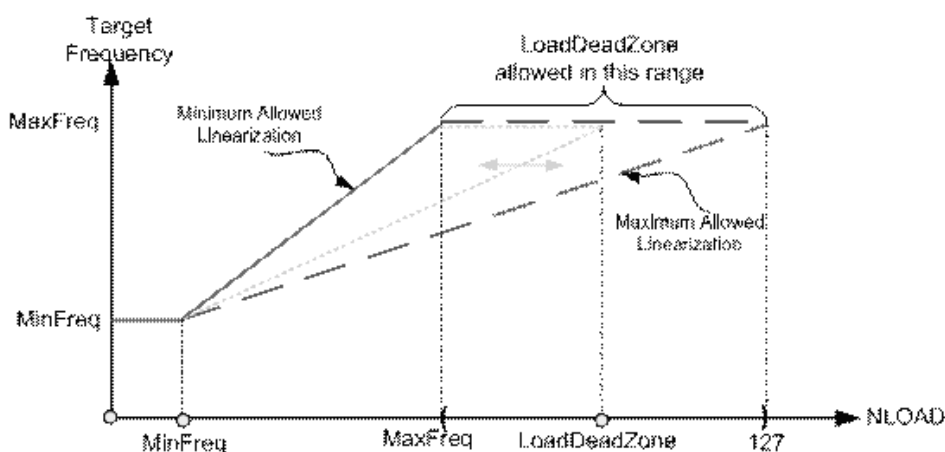
| OAT Range     | Cool mode limits | Heat mode limits |
|---------------|------------------|------------------|
| OAT < 6       | MaxFreqAsOATC    | No limit         |
| 6 ≤ OAT < 20  |                  | MaxFreqAsOAT1H   |
| 20 ≤ OAT < 26 |                  | MaxFreqAsOAT2H   |
| 26 ≤ OAT      | No limit         |                  |

## 2. For S/W 370V and higher (For 467300225R Controller):

| NLOAD           | Target Frequency [Hz]  |               |
|-----------------|--|---------------|
| 0               | 0  |               |
| 0<NLOAD≤MinFreq | MinFreq  |               |
| >MinFreq        | $\frac{\text{MaxFreq} - \text{MinFreq}}{\text{LoadDeadZone} - \text{MinFreq}} \cdot \{ \min(\text{NLOAD}, \text{LoadDeadZone}) - \text{MinFreq} \} + \text{MinFreq}$ |               |
| Definitions     |  |               |
|                 | Cool   | Heat          |
| MinFreq         | MinFreqC   | MinFreqH      |
| MaxFreq         | MaxFreqC   | MaxFreqH      |
| LoadDeadZone    | LoadDeadZoneC  | LoadDeadZoneH |

## LoadDeadZone calculation

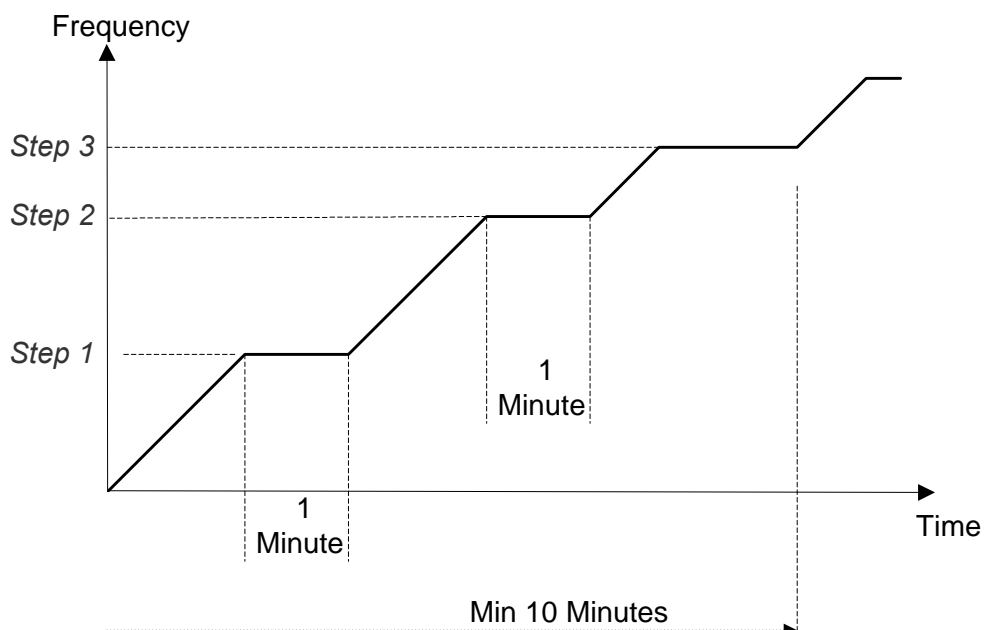
Refer to the following diagram for the above description:



## 11.1.3.3 Frequency Changes Control

Frequency change rate is 1 Hz/sec.

## 11.1.3.4 Compressor Starting Control



### 11.1.3.5 Minimum On and Off Time

3 minutes.

### 11.1.4 Indoor Fan Control

10 Indoor fan speeds are determined for each model. 5 speeds for cool/dry/fan modes and 5 speeds for heat mode.

When user sets the indoor fan speed to a fixed speed (Low/ Medium/ High), unit will operate constantly at set speed.

When Auto Fan is selected, indoor unit controller can operate in all speeds. The actual speed is set according to the cool/heat load.

#### 11.1.4.1 Turbo Speed

The Turbo speed is activated during the first 30 minutes of unit operation when auto fan speed is selected and under the following conditions:

- Difference between set point and actual room temperature is bigger then 3 degrees.
- Room temperature > 22 for cooling, or < 25 for heating.

### 11.1.5 Heating Element Control

Heating element can be started if  $LOAD > 0.8 * MaximumNLOAD$  AND Indoor Coil temperature < 45.

The heating element will be stopped when  $LOAD < 0.5 * MaximumNLOAD$  OR if Indoor Coil temperature > 50.

### 11.1.6 Outdoor Fan Control

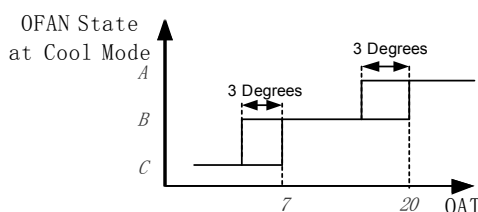
#### 11.1.6.1 The following are the speeds types (General Rules):

1. For S/W 37V3 and lower ( For 453031000R Controller)

The OFAN motor is an AC type that operates with 2 speeds (Low/High), controlled by .Relays

OFAN speed depends on the compressor Target Frequency, and is set according to the following table and graphs below and OFAN can change its Speed only if it has been working in the current speed for at least 35 seconds:

|                                   | OFAN Speed                          |                 |                 |                   |
|-----------------------------------|-------------------------------------|-----------------|-----------------|-------------------|
| Compressor Target Frequency       | Normal cases State A at cool / Heat | State B at cool | State C at cool | OAT>15 °C at heat |
| Freq=0                            | OFF                                 | OFF             | OFF             | OFF               |
| $10 \leq Freq < OFLowFreq$        | Low                                 | Low             | Low             | Low               |
| $OFLowFreq \leq Freq < OFMedFreq$ | High                                | Low             | Low             | Low               |
| $OFMedFreq \leq Freq$             | High                                | Low             | Low             | High              |



Note: Periorities A>B>C

## Notes:

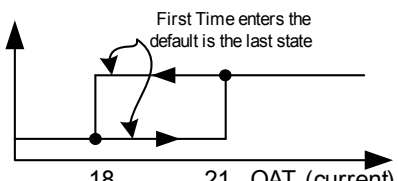
When OAT is faulty or disabled OFAN will follow 'Normal cases' rules (left column).

1. The table above can be overruled during protections.
2. OFLowFreq = OFLowFreqC in cool mode, and OFLowFreqH in heat mode.
3. OFMedFreq = OFMedFreqC in cool mode, and OFMedFreqH in heat mode.
  - The OFAN will be off when the compressor is off.
  - An exception for the following rule is when compressor was operating in cool mode before stopped. In this case OFAN will remain on in low speed for 1 minute.
  - Whenever the indoor unit is under indoor coil overheating protection, as long as the protection status is HzD2, the outdoor fan will change to off. It will be enabled to be back on when the status of this protection becomes normal.
  - Upon receiving night mode signal (ON), through communication, the OFAN will be operating in LOW speed only in Cool. It will be back to its normal operation when receiving OFF signal.

**For S/W 370V and higher (For 467300225R Controller)**

#### 11.1.6.2 OFAN Operation in Cooling Mode

With keeping the OFAN general rules above in the highest priority, the operation of the OFAN will be operating as the following:

| OAT <sub>Initial</sub>                    | Time After Compressor start up (minutes) |   |
|---|--|---|
|   | 0 – 3min                                 | > 3min  |
| OAT <sub>Initial</sub> >20<br>(or Faulty) | High(Relay)                              |  <p>High (Relay)</p> <p>Low (Triac)- By CDT</p> <p>Note: OAT faulty, use High Speed</p> |
| OAT <sub>Initial</sub> ≤20                | Low(Triac)- Open Loop                    |   |

**Note:**  
The OAT<sub>Initial</sub> value represents one OAT reading exactly **at the moment start up** (actual freq>0).  
Low (Triac)- By OMT represents the operation of the Low Fan speed controlled by Triac according to OMT sensor.

CDT=max (OMT,OCT)

When in low (By CDT), the OFAN will reduce the speed

Whenever CDT is low, and

#### 11.1.6 OFAN operation in heating mode

The outdoor fan will always be running at High speed during heating operation mode.

##### OFAN operation under Protections

The OFAN will switch to High Speed in the following cases:

1. Cooling mode AND
2. Compressor On (actual frequency>0).

HST, CTT, CDT, Current protections at HzDown1 or HzDown2 statuses

### 11.1.7 EEV (electronic Expansion valve) Control

#### 1. For S/W 37V3 and lower ( For 453031000R Controller)

EEV opening is defined as  $EEV = EEV_{OL} + EEV_{CV}$

- $EEV_{OL}$  is the initial EEV opening as a function of the compressor frequency, operation mode, unit model and capacity.
- $EEV_{CV}$  is a correction value for the EEV opening that is based on the compressor temperature.
- During the first 5 minutes of compressor operation  $EEV_{CV} = 0$ .
- Once the first 5 minutes are over, the correction value is calculated as follow:  

$$EEV_{CV}(n) = EEV_{CV}(n-1) + EEV_{CTT}$$
- $EEV_{CTT}$  is the correction based on the compressor temperature. A target compressor temperature is set depending on frequency and outdoor air temperature, and the actual compressor temperature is compared to the target temperature to set the required correction to the EEV opening.

#### 2. For S/W 370V and higher (For 467300225R Controller)

The EEV will be operating according to the discharge super heat value.  
 Whenever the discharge super heat is too high, the EEV will be opening.  
 Whenever the discharge super heat is too low, the EEV will be closing.  
 In cooling, the discharge super heat is calculated by CTT-OMT  
 In heating, the discharge super heat is calculated by CTT-ICT  
 Normal values of discharge super heat  
 Cooling: 18°C-35°C  
 Heating: 15°C-32°C

### 11.1.8 Reversing Valve (RV) Control

Reversing valve is on in heat mode.

Switching of RV state is done only after compressor is off for over 3 minutes.

## 11.2 Fan Mode

In high/ medium/ low indoor fan user setting, unit will operate fan in selected speed.

In AutoFan user setting, fan speed will be adjusted automatically according to the difference between actual room temperature and user set point temperature.

## 11.3 Cool Mode

NLOAD is calculated according to the difference between actual room temperature and user set point temperature by PID control.

In high/ medium/ low indoor fan user setting, unit will operate fan in selected speed.

In AutoFan user setting, fan speed will be adjusted automatically according to the calculated NLOAD.

## 11.4 Heat Mode

NLOAD is calculated according to the difference between actual room temperature and user set point temperature by PI control.

In high/ medium/ low indoor fan user setting, unit will operate fan in selected speed.

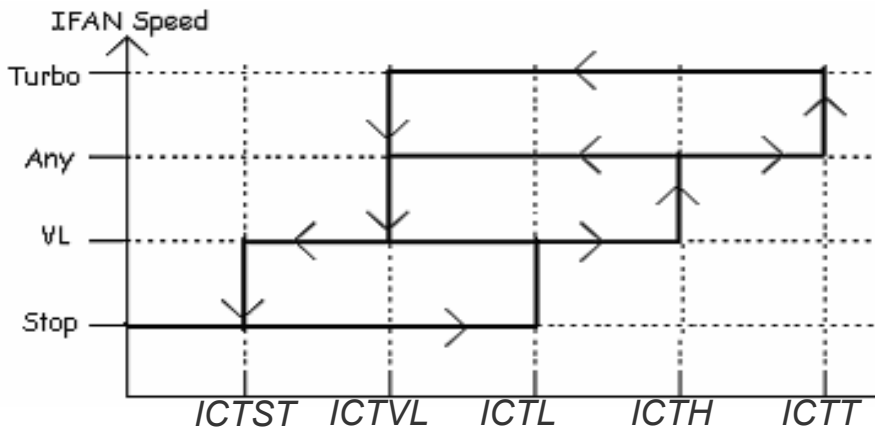
In AutoFan user setting, fan speed will be adjusted automatically according to the calculated NLOAD.

### 11.4.1 Temperature Compensation

4 degrees are reduced from RT sensor temperature reading (excluding I-Feel mode), to compensate for temperature difference between high and low areas in the heated room, and due to coil heat radiation on RT sensor.

### 11.4.2 Indoor Fan Control in Heat Mode

Indoor fan speed depends on the indoor coil temperature:



## 11.5 Auto Cool/Heat Mode

When in auto cool heat mode unit will automatically select between cool and heat mode according to the difference between actual room temperature and user set point temperature ( $\Delta T$ ).

Unit will switch from cool to heat when compressor is off for 3 minutes, and  $\Delta T < -3$ .

Unit will switch from heat to cool when compressor is off for 5 minutes, and  $\Delta T < -3$ .

## 11.6 Dry Mode

As long as room temperature is higher than the set point, indoor fan will work in low speed and compressor will work between 0 and *MaxNLOADIF1C* Hz.

When the room temperature is lower than the set point, compressor will be switched OFF and indoor fan will cycle 3 minutes OFF, 1 minute ON.

## 11.7 Protections

There are 5 protection codes.

Normal (Norm) – unit operate normally.

Stop Rise (SR) – compressor frequency can not be raised but does not have to be decreased.

HzDown1 (D1) – Compressor frequency is reduced by *Down1* Hz/min.

HzDown2 (D2) – Compressor frequency is reduced by *Down2* Hz/min.

Stop Compressor (SC) – Compressor is stopped.

### 11.7.1 Indoor Coil Defrost Protection

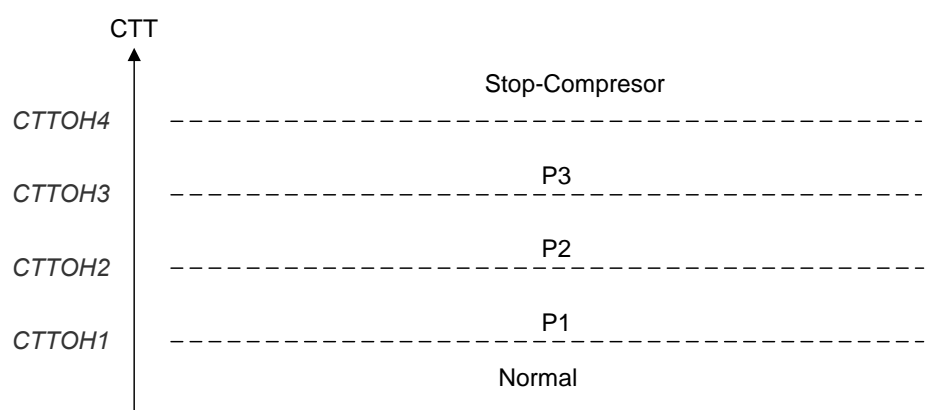
| ICT               | ICT Trend       |            |           |            |                 |
|-------------------|-----------------|------------|-----------|------------|-----------------|
|                   | Fast Increasing | Increasing | No change | Decreasing | Fast Decreasing |
| $ICT < -2$        | SC              | SC         | SC        | SC         | SC              |
| $-2 \leq ICT < 0$ | D1              | D1         | D2        | D2         | D2              |
| $0 \leq ICT < 2$  | SR              | SR         | D1        | D2         | D2              |
| $2 \leq ICT < 4$  | SR              | SR         | SR        | D1         | D2              |
| $4 \leq ICT < 6$  | Norm            | Norm       | SR        | SR         | D1              |
| $6 \leq ICT < 8$  | Norm            | Norm       | Norm      | SR         | SR              |
| $8 \leq ICT$      | Normal          |            |           |            |                 |

### 11.7.2 Indoor Coil over Heating Protection

| ICT                | ICT Trend       |            |           |            |                 |
|--------------------|-----------------|------------|-----------|------------|-----------------|
|                    | Fast Decreasing | Decreasing | No Change | Increasing | Fast Increasing |
| $ICT > 55$         | SC              | SC         | SC        | SC         | SC              |
| $53 < ICT \leq 55$ | D1              | D1         | D2        | D2         | D2              |
| $49 < ICT \leq 53$ | SR              | SR         | D1        | D2         | D2              |
| $47 < ICT \leq 49$ | SR              | SR         | SR        | D1         | D2              |
| $45 < ICT \leq 47$ | Norm            | Norm       | SR        | SR         | D1              |
| $43 < ICT \leq 45$ | Norm            | Norm       | Norm      | SR         | SR              |
| $ICT \leq 43$      | Normal          |            |           |            |                 |

### 11.7.3 Compressor over Heating Protection

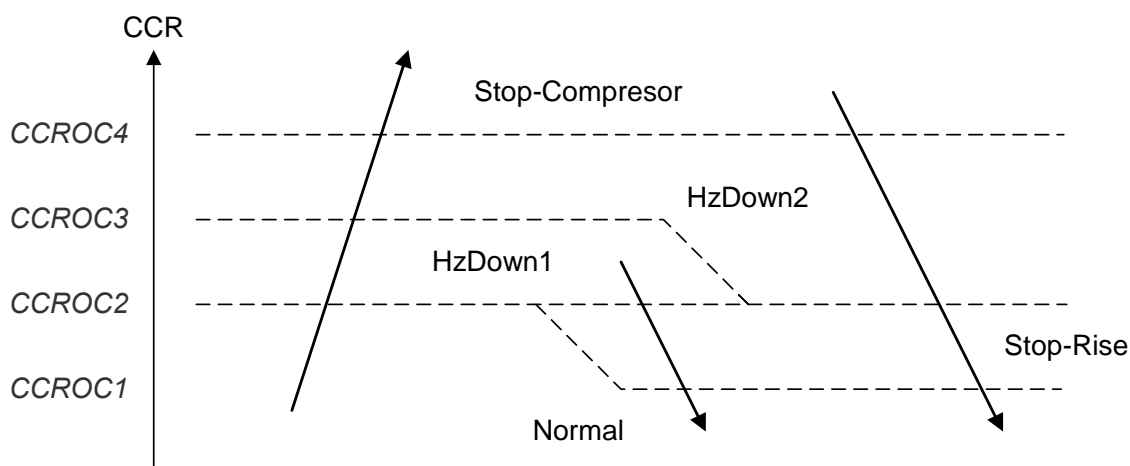
Compressor temperature can be in one of 5 control zones (4 in protection, and 1 normal), according to the following chart.



| Control Status  | Compressor Temperature Increases | Else |
|-----------------|----------------------------------|------|
| P1              | Norm                             | SR   |
| P2              | D1                               | SR   |
| P3              | D2                               | D1   |
| Stop Compressor | SC                               |      |



### 11.7.4 Compressor over Current Protection



### 11.7.5 Heat Sink Over Heating Protection

| HST           | HST Trend  |           |            |
|---------------|------------|-----------|------------|
|               | Decreasing | No Change | Increasing |
| HST > 90      | SC         | SC        | SC         |
| 85 < HST ≤ 90 | D1         | D2        | D2         |
| 82 < HST ≤ 85 | SR         | D1        | D2         |
| 80 < HST ≤ 82 | SR         | SR        | D1         |
| 78 < HST ≤ 80 | Norm       | Norm      | SR         |
| HST ≤ 78      | Normal     |           |            |

### Outdoor Coil Overheating Protection

$CDT_n$  is the current reading of CDT and  $CDT_{n-1}$  is the last reading of CDT.

| $CDT_n$                      | $CDT_n - CDT_{n-1}$ |      |      |    |    |
|------------------------------|---------------------|------|------|----|----|
|                              | <-1                 | -1   | 0    | 1  | >1 |
| $CDT > CDT_{HSTOH5}$         | SC                  | SC   | SC   | SC | SC |
| $CDTOH4 \leq CDT_n < CDTOH5$ | D1                  | D1   | D2   | D2 | D2 |
| $CDTOH3 \leq CDT_n < CDTOH4$ | SR                  | SR   | D1   | D2 | D2 |
| $CDTOH2 \leq CDT_n < CDTOH3$ | SR                  | SR   | SR   | D1 | D1 |
| $CDTOH1 \leq CDT_n < CDTOH2$ | Norm                | Norm | Norm | SR | SR |
| $CDT_n < CDTOH1$             | Norm                |      |      |    |    |

(\*) **Normal (Norm)** – No protection status is ON.

**Stop-Rise (SR)** – System is in protection.

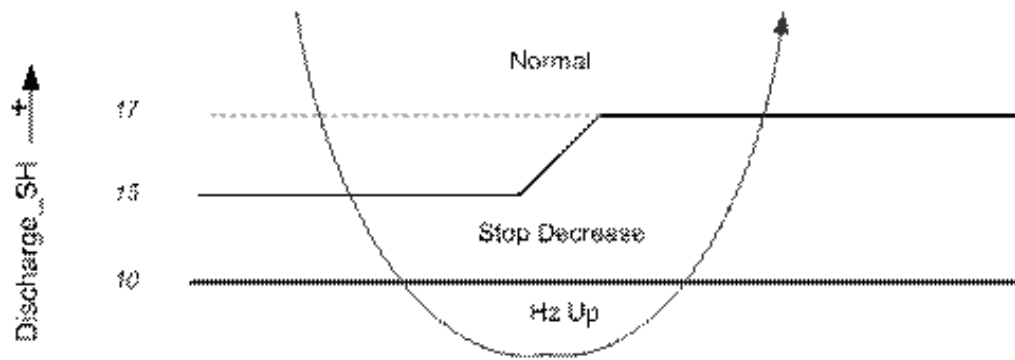
**HzDown1 (D1)** - System is in protection.

**HzDown2 (D2)** - System is in protection.

### DISCHARGE SUPER HEAT PROTECTION

For S/W 370V and higher (For 467300225R Controller)

Since this model does not have EEV, the discharge superheat is controlled by adjusting the compressor frequency through the down to up protection



For cooling: Discharge super heat = CTT - CDT

For heating: Discharge super heat = CTT - ICT

(Where CDT = MAX(OCT, OMT)

**.Normal** – No protection status is ON

**.Stop-Decrease** – System is in protection. Compressor frequency is not allowed to decrease

**HzUp** – System is in protection. Compressor frequency is increased by 3 Hz/min

### 11.7.6 Outdoor Coil Deicing Protection

#### 11.7.6.1 Deicing Starting Conditions

1. For S/W 37V3 and lower ( For 453031000R Controller)

Deicing operation will start when either one of the following conditions exist

Deicing operation will start when either one of the following conditions exist:

- Case 1: OCT < OAT – 8 AND TLD > DI
- Case 2: OCT < OAT<sub>max</sub> – 12 AND TLD > 30 minutes.
- Case 3: OCT < -1 AND TLD > 100 minutes.
- Case 4: OCT is Invalid AND TLD > DI
- Case 5: NLOAD = 0 AND OCT < OAT - 8
- Case 6: OCT < -19 AND TLD > 60min:

When OAT<sub>max</sub> > 0 or OAT is invalid; then DST = 8

When OAT<sub>max</sub> ≤ 0; then DST = round down (-0.8 \* OAT<sub>max</sub>) + 8

OAT<sub>max</sub> calculation:

After compressor starts for 3 minutes, OAT<sub>max</sub> calculation is start.

The OAT<sub>max</sub> is the moving value of the Maximum OAT during the 1st 10 minutes within last 30 minutes

OCT – Outdoor Coil Temperature

OAT – Outdoor Air Temperature

TLD – Time from Last Deicing

DI – Deicing Interval (Time Interval Between Two Deicing)

Deicing interval time when compressor is first started in heat mode, is 10 minutes if OCT < -2, and is 40 minutes in other cases.

Deicing interval time is changed (increased/ decreased in 10 minutes steps) as a function of deicing time. If deicing time is shorter than former deicing time, the deicing interval time will be increased. If deicing time is longer than former deicing time, the deicing interval time will be decreased.

## 2. For S/W 370V and higher (For 467300225R Controller)

Deicing operation will start when either one of the following conditions exist:

- Case 1:  $OCT < DST$  AND  $TLD > DI$
- Case 2:  $OCT < OAT_{max} - 12$  AND  $TLD > DI$ .
- Case 3:  $OCT$  is Invalid AND  $TLD > DI$
- Case 4: Unit is just switched to STBY AND  $OCT < DST$
- Case 5:  $NLOAD = 0$  AND  $OCT < DST$
- Case 6:  $OCT < -1$  AND  $TLD > 100min$

DST Definition:

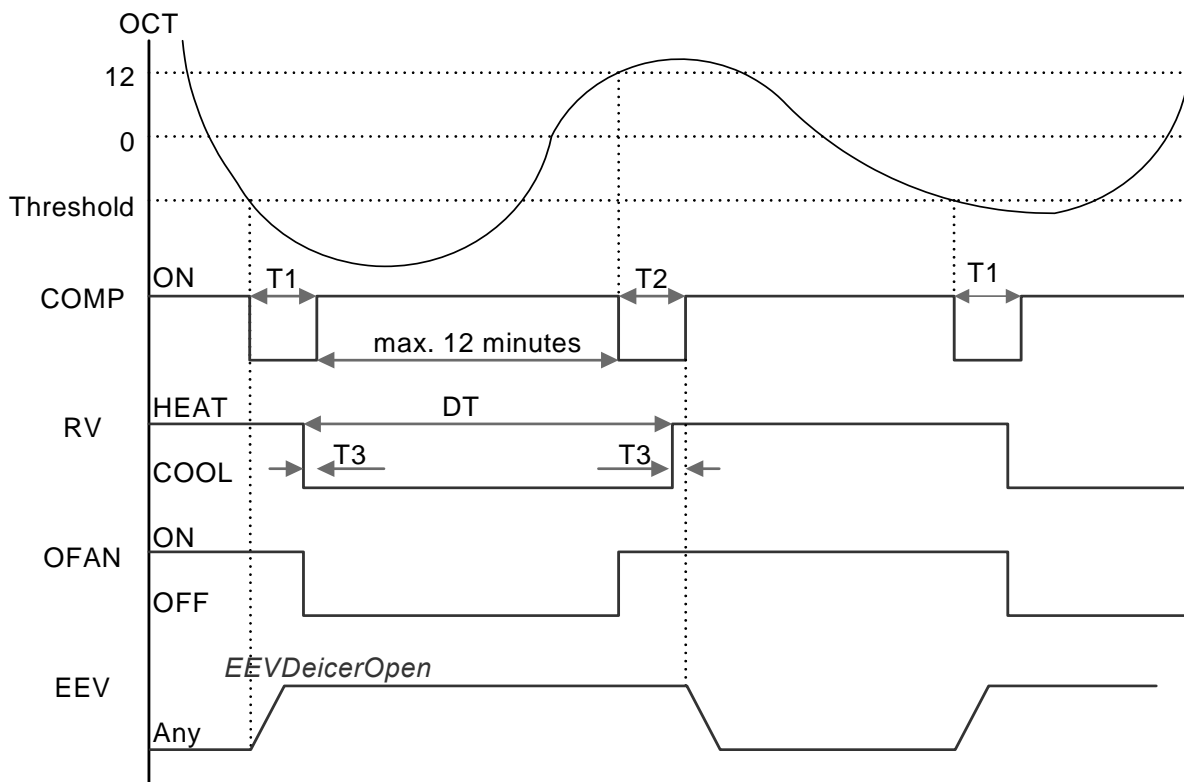
When  $OAT_{max} > 0$ , then  $DST = 8$

When  $OAT_{max} \leq 0$ , then  $DST = -0.8 \times OAT_{max} + 8$

$OAT_{max} = \text{Rolling/Moving}$

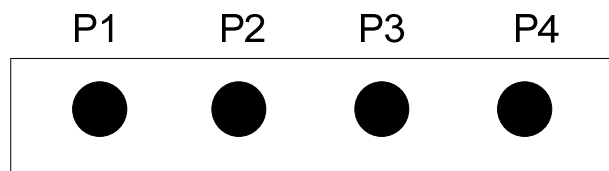
Max. of  $OAT$  during the 10 mins before the last 20 mins

### 11.7.6.2 Deicing Protection Procedure



$T1 = DEICT1$ ,  $T2 = DEICT2$ ,  $T3 = DEICT3$

### 11.7.7 Condensate Water Over Flow Protection



Level Connector Top View

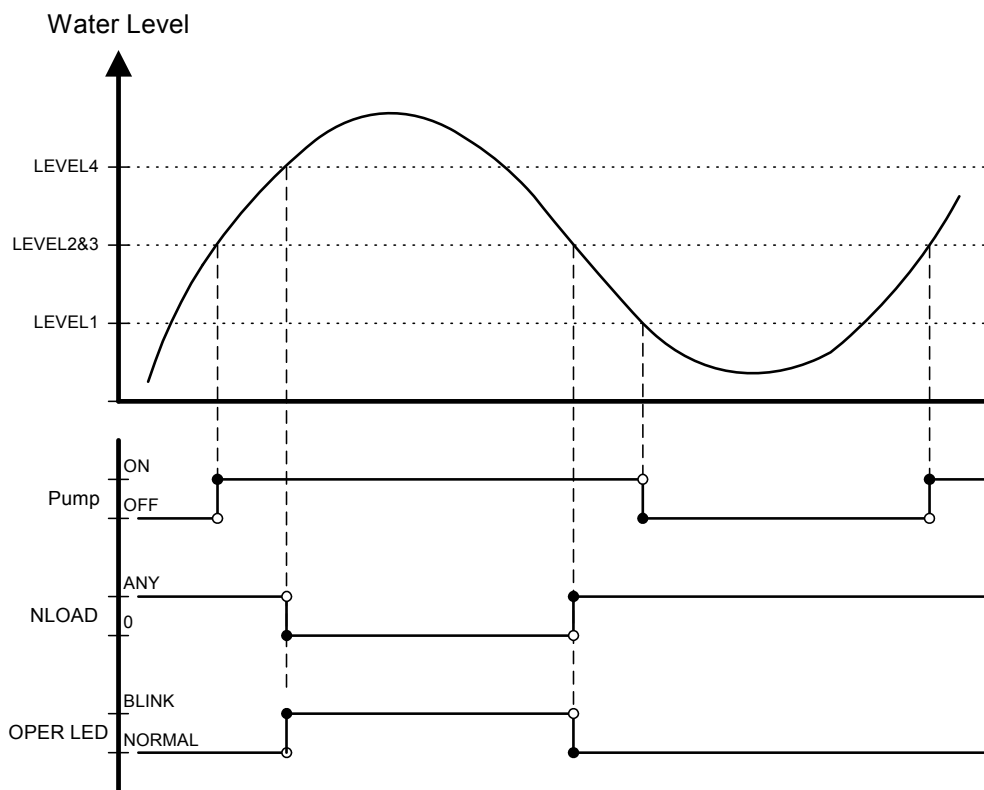
Each of the pins P1, P2, P3 can have two options:

1 – When it is shorted with P4

0 – When it is not shorted to P4

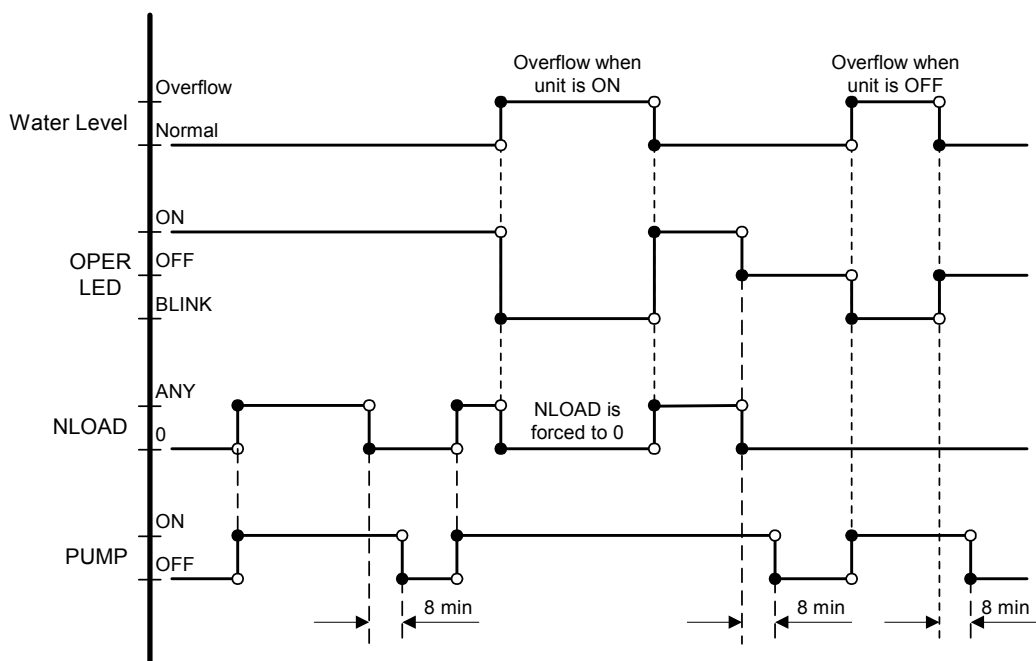
### 11.7.7.1 3 Levels Logic (used in floor/ceiling models)

| P2 | P3 | Level |
|----|----|-------|
| 0  | 0  | L0    |
| 1  | 0  | L1    |
| 1  | 1  | L2&3  |
| 0  | 1  | L4    |



### 11.7.7.2 1 Level Logic (used in all models except for floor/ceiling models)

| P2         | P3 | Level    |
|------------|----|----------|
| Don't care | 1  | Normal   |
| Don't care | 0  | Overflow |



## 11.8 Indoor Unit Dry Contact

Indoor unit Dry contact has two alternative functions that are selected by J8.

|            | Function                     | Contact = Open | Contact = Short |
|------------|------------------------------|----------------|-----------------|
| J8 = Open  | Presence Detector Connection | No Limit       | Forced to STBY  |
| J8 = Short | Power Shedding Function      | No Limit       | Limit NLOAD     |

## 11.9 Operating the Unit from the Mode Button

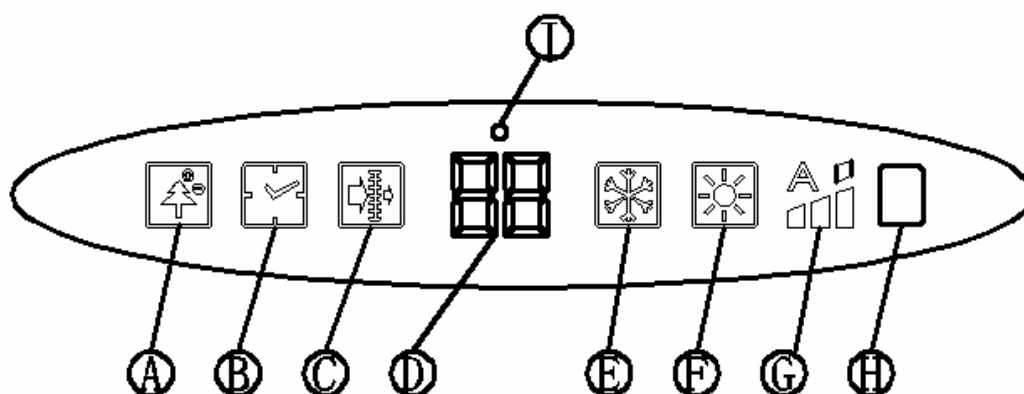
Forced operation allows to start, stop and operate in Cooling or Heating, in pre-set temperature according to the following table:

| Forced operation Mode | Pre-set Temperature |
|-----------------------|---------------------|
| Cooling               | 20°C                |
| Heating               | 28°C                |

## 11.10 On Unit Controls and Indicators

### 11.10.1 Indoor Unit Controller Controls and Indicators For All Models

The following is schematic drawing for the display:



- A ----- Ionizer
- B ----- Timer
- C ----- Filter
- D ----- Temperature Icon
- E ----- Cool Icon
- F ----- Heat Icon
- G ----- Fan Speed
- H ----- Infra-Red(IR) receiver
- I ----- Standby LED

|                             |  |
|-----------------------------|--|
| <b>Operation Indication</b> | <ol style="list-style-type: none"> <li>1. Cool ICON Lights up during Cool, Dry or Auto modes (not Fan). Even though the mode can be changed automatically from Auto Cool to Auto Heat, the Cool will light on.</li> <li>2. Heat ICON Lights up in Red color during heat mode. It will not light up during Auto Heat mode.</li> <li>3. Blinks continuously during Indoor/Outdoor protections (according to the relevant spec section). During heating the Heat Icon blinks. In Cool, Dry, Or Auto modes the Cool Icon blinks.</li> </ol>                |
| <b>Mode/Reset Button</b>    | <p>As long as the filter counter is bigger than 0, the Mode/Reset button functions as Mode switch. Once filter counter is 0, the Mode/Reset button functions as Reset switch.</p> <p>Mode Function:<br/>Every short pressing , the next operation mode is selected, in this order: SB → Cool Mode → Heat Mode → SB → ...<br/>In long pressing system enters diagnostic mode (refer to diagnostic mode Sect.)</p> <p>Reset Function:<br/>For short pressing:<br/>Reset the filter counter. Refer to the diagram above for the filter LED operation.</p> |
| <b>7 segment LEDs</b>       | <p>Refer to the diagram above.</p> <p>During diagnostics mode the 7 segment LED will show the fault code (refer to diagnostics Section).</p>   |

### 11.10.2 Outdoor Unit Controller Indicators

Unit has three LED's.

SB LED is ON when power is ON (230 VAC,even when no communication).

STATUS LED is ON when COMP is ON, and Blinks according to diagnostics mode definitions when either fault or protection occurs.

FAULT LED Blinks according to diagnostics mode definitions when either fault or protection occurs.

## 11.11 Jumper Settings

### 11.11.1 Indoor Unit Controller

#### 11.11.1.1 Hardware Jumpers

0 = Open Jumper (disconnect jumper).

1 = Close Jumper (connect jumper).

Self test Jumper – J1

| OPERATION | J1 |
|-----------|----|
| SELF-TEST | 1  |
| NORMAL    | 0  |

## Family selection Jumper – J2

| HW                            | Model  | J2 (Default) | Compensation |
|-------------------------------|--|--------------|--------------|
| Use Jumper                    | -WNG/WNG18/WNG30/  | 0            | Activated    |
| Use Model Plug                | PXD/AC/NPXD  | 1            | Deactivated  |
| Use Model Plug/<br>DIP switch | LS/K/KS /AD/DNG/KN/CN <sub>A</sub> /CN <sub>B</sub> /<br>'EMD 4-5 hp/DS 4-5 hp'<br>DNG 4-5 hp / KN 4-5-6 hp / CD 5-6 hp<br>LSN <sub>A</sub> /LSN <sub>B</sub> /TOP DCI/NKN<br>HAD <sub>A</sub> /HAD <sub>B</sub> /Delta <sub>A</sub> /Delta <sub>B</sub> | 1            | Activated    |

## Model selection Jumper – J3, J4

| Model | J3 | J4 |
|-------|----|----|
| A     | 0  | 0  |
| B     | 0  | 1  |
| C     | 1  | 0  |
| D     | 1  | 1  |

## 11.11.1.2 Software Jumpers

| Property                       | 0           | 1          | 2                          |
|--------------------------------|-------------|------------|----------------------------|
| EEPROM DATA (J1)               | Use ROM*    | Use EEPROM | NA                         |
| 'Thermostatic Stop- Heat' (J2) | Deactivated | Activated  | NA                         |
| 'Heat to STBY' (J3)            | Deactivated | Activated  | NA                         |
| Water Level Protection (J4)    | 1 Level     | 3 Levels   | No Water Protection-ignore |
| Enable Test Mode (J5)          | Deactivated | Activated* | NA                         |

\* Default values (used in the ROM)

Default SW jumpers according to the family (used in the ROM)

| Property                       | HAD007 / HAD009 / HAD012 |
|--------------------------------|--------------------------|
| 'Thermostatic Stop- Heat' (J2) | 0                        |
| 'Heat to STBY' (J3)            | 1                        |

## J1 – EEPROM/ROM setting

When J1 is 1, IDU will use model/family/general parameters from EEPROM. If EEPROM is invalid, IDU will ignore J1 and use/copy the ROM pointed by the selected jumpers (will also set an according fault).

## 11.11.2 Outdoor Unit Controller

For S/W 37V3 and lower ( For 453031000R Controller)

## 11.11.2.1 Hardware Jumpers

JP9 JUMPER LAYOUT

|                     |              |              |              |              |
|---------------------|--------------|--------------|--------------|--------------|
| EEPROM Data (PIN 9) | ODU3 (PIN 7) | ODU2 (PIN 5) | ODU1 (PIN 3) | ODU0 (PIN 1) |
| GND (PIN 10)        | GND (PIN 8)  | GND (PIN 6)  | GND (PIN 4)  | GND (PIN 2)  |

## ODU MODEL SELECTION

| ODU3             | ODU2             | ODU1             | ODU0             | ODU Model         |
|------------------|------------------|------------------|------------------|-------------------|
| OFF              | OFF              | OFF              | OFF              | Reserved          |
| OFF              | OFF              | OFF              | ON (PIN1 & PIN2) | A (Single DCR 20) |
| OFF              | OFF              | ON (PIN3 & PIN4) | OFF              | B (Single DCR 25) |
| OFF              | OFF              | ON (PIN3 & PIN4) | ON (PIN1 & PIN2) | C (Single DCR 35) |
| OFF              | ON (PIN5 & PIN6) | OFF              | OFF              | D                 |
| OFF              | ON (PIN5 & PIN6) | OFF              | ON (PIN1 & PIN2) | E (Duo DCI 50)    |
| OFF              | ON (PIN5 & PIN6) | ON (PIN3 & PIN4) | OFF              | F                 |
| OFF              | ON (PIN5 & PIN6) | ON (PIN3 & PIN4) | ON (PIN1 & PIN2) | G                 |
| ON (PIN7 & PIN8) | OFF              | OFF              | OFF              | H                 |
| ON (PIN7 & PIN8) | OFF              | OFF              | ON (PIN1 & PIN2) | I                 |
| ON (PIN7 & PIN8) | OFF              | ON (PIN3 & PIN4) | OFF              | J                 |
| ON (PIN7 & PIN8) | OFF              | ON (PIN3 & PIN4) | ON (PIN1 & PIN2) | K                 |
| ON (PIN7 & PIN8) | ON (PIN5 & PIN6) | OFF              | OFF              | L                 |
| ON (PIN7 & PIN8) | ON (PIN5 & PIN6) | OFF              | ON (PIN1 & PIN2) | M                 |
| ON (PIN7 & PIN8) | ON (PIN5 & PIN6) | ON (PIN3 & PIN4) | OFF              | N                 |
| ON (PIN7 & PIN8) | ON (PIN5 & PIN6) | ON (PIN3 & PIN4) | ON (PIN1 & PIN2) | O                 |

## PCB JUMPER SETTING FOR J2 HEAD

| RXD (PIN 2) | TEST (PIN 4) | GND (PIN 6)    |
|-------------|--------------|----------------|
| VCC (PIN 1) | N/C (PIN 3)  | TXD100 (PIN 5) |

1. Connect **PIN 4** and **PIN 6** to enter Built-in-Test.
2. RXD, TXD100, VCC is for MegaTools connection.

## PCB JUMPER J1 HEADER

J1 header is used for program flash.

### 11.11.2.2 Software Jumpers

| Property         | 0        | 1          |
|------------------|----------|------------|
| EEPROM DATA (J1) | Use ROM* | Use EEPROM |

\* Default values (used in the ROM)

### J1 – EEPROM/ROM setting

When J1 is 1, ODU will use model/general parameters from EEPROM. If EEPROM is invalid, ODU will ignore J1 and use/copy the ROM pointed by the selected jumpers (will also set an according fault).

## For S/W 370V and higher (For 467300225R Controller)

### Hardware Jumpers

#### JP9 JUMPER LAYOUT

| EEPROM Data (PIN 9) | ODU3(PIN 7) | ODU2(PIN 5) | ODU1(PIN 3) | ODU0(PIN 1) |
|---------------------|-------------|-------------|-------------|-------------|
| GND (PIN 10)        | GND (PIN 8) | GND (PIN 6) | GND (PIN 4) | GND (PIN 2) |

ON is defined as shorted, while OFF is defined as disconnected.



## ODU MODEL SELECTION

| ODU3 | ODU2 | ODU1 | ODU0 | ODU Model                        | Compressor Type            |
|------|------|------|------|----------------------------------|----------------------------|
| OFF  | OFF  | OFF  | OFF  | Reserved                         |                            |
| OFF  | OFF  | OFF  | ON   | A (Single DCR 22- Use Capillary) | Toshiba-DA89 (4 Poles)     |
| OFF  | OFF  | ON   | OFF  | B (Single DCR 25- Use Capillary) | Toshiba-DA89 (4 Poles)     |
| OFF  | OFF  | ON   | ON   | C (Single DCR 35- Use Capillary) | Toshiba- DA108 (4 Poles)   |
| OFF  | ON   | OFF  | OFF  | D (Reserved)                     |                            |
| OFF  | ON   | OFF  | ON   | E (Single DCR 22- Use EEV)       | Panasonic-5RS092 (6 Poles) |
| OFF  | ON   | ON   | OFF  | F (Single DCR 25- Use EEV)       | Panasonic-5RS092 (6 Poles) |
| OFF  | ON   | ON   | ON   | G (Single DCR 35- Use EEV)       | Panasonic-5RS102(6 Poles)  |
| ON   | OFF  | OFF  | OFF  | H                                |                            |
| ON   | OFF  | OFF  | ON   | I                                |                            |
| ON   | OFF  | ON   | OFF  | J                                |                            |
| ON   | OFF  | ON   | ON   | K                                |                            |
| ON   | ON   | OFF  | OFF  | L                                |                            |
| ON   | ON   | OFF  | ON   | M                                |                            |
| ON   | ON   | ON   | OFF  | N                                |                            |
| ON   | ON   | ON   | ON   | O                                |                            |

### PCB JUMPER SETTING FOR J2 HEADER

|                    |                     |                       |
|--------------------|---------------------|-----------------------|
| <b>RXD</b> (PIN 2) | <b>TEST</b> (PIN 4) | <b>GND</b> (PIN 6)    |
| <b>VCC</b> (PIN 1) | <b>N/C</b> (PIN 3)  | <b>TXD100</b> (PIN 4) |

1. Connect **PIN 4** and **PIN 6** to enter Built-in-Test.
2. RXD, TXD100, VCC is for MegaTools connection.

### PCB JUMPER J1 HEADER

J1 header is used for program flash.

### Software Jumpers

| Property         | 0        | 1          |
|------------------|----------|------------|
| EEPROM DATA (J1) | Use ROM* | Use EEPROM |

\* Default values (used in the ROM)

### J1 – EEPROM/ROM setting

When J1 is 1, ODU will use model/general parameters from EEPROM. If EEPROM is invalid, ODU will ignore J1 and use/copy the ROM pointed by the selected jumpers (will also set an according fault).

## 11.12 Test Mode

### 11.12.1 Entering Test Mode

System can enter Test mode in two ways:

- Automatically when the following conditions exists for 30 minutes continuously:
  - Mode = Cool, Set point = 16, Room temperature =  $27 \pm 1$ , Outdoor temperature =  $35 \pm 1$
- Or
  - Mode = Heat, Set point = 30, Room temperature =  $20 \pm 1$ , Outdoor temperature =  $7 \pm 1$
- Manually when entering diagnostics with the following settings:
  - Mode = Cool, Set point = 16
  - Mode = Heat, Set point = 30

### 11.12.2 Unit Operation in Test Mode

In test mode, the unit will operate in fixed settings according to the indoor fan speed setting:

| Indoor Fan Speed Setting | Unit Setting             |
|--------------------------|--------------------------|
| Low                      | Minimum Capacity Setting |
| High                     | Nominal Capacity Setting |
| Auto                     | Maximum Capacity Setting |

During test mode, protections are disabled, except for stop compressor status.

## 11.13 SW Parameters

### 11.13.1 Indoor Units SW Parameters

#### 11.13.1.1 General Parameters for All Models:

**Parameters defining the indoor fan speed as a function of Indoor Coil temperature in heat mode (ICT):**

|             |  |    |
|-------------|--|----|
| ICTST Speed | ICT to stop indoor fan                       | 25 |
| ICTVLSpeed  | ICT to go down to very low speed             | 28 |
| ICTLSpeed   | ICT to start in very low speed               | 30 |
| ICTHSpeed   | ICT to start in increase speed from very low | 32 |
| ICTTSpeed   | ICT to enable Turbo fan speed                | 40 |

**Parameters for defrost protection:**

|         |                                       |    |
|---------|---------------------------------------|----|
| ICTDef1 | ICT to go back to normal              | 8  |
| ICTDef2 | ICT to 'stop rise' when ICT decrease  | 6  |
| ICTDef3 | ICT to 'stop rise' when ICT is stable | 4  |
| ICTDef4 | ICT to 'Hz Down' when ICT decrease    | 2  |
| ICTDef5 | ICT to 'Hz Down' when ICT is stable   | 0  |
| ICTDef6 | ICT to stop compressor                | -2 |

**Parameters for indoor coil over heating protection:**

|        |                                       |    |
|--------|---------------------------------------|----|
| ICTOH1 | ICT to go back to normal              | 45 |
| ICTOH2 | ICT to 'stop rise' when ICT increase  | 48 |
| ICTOH3 | ICT to 'stop rise' when ICT is stable | 52 |
| ICTOH4 | ICT to 'Hz Down' when ICT increase    | 55 |
| ICTOH5 | ICT to 'Hz Down' when ICT is stable   | 60 |
| ICTOH6 | ICT to stop compressor                | 62 |

**11.13.1.2 Model Depended Parameters:**

| Parameter name   | Models |      |      |
|--|--------|------|------|
|  | 007    | 009  | 012  |
| <b>NLOAD limits as a function of selected indoor fan speed</b> |        |      |      |
| MaxNLOADIF1C   | 40     | 40   | 40   |
| MaxNLOADIF2C   | 55     | 51   | 55   |
| MaxNLOADIF3C   | 127    | 127  | 127  |
| MaxNLOADIF4C   | 127    | 127  | 127  |
| MaxNLOADIF5C   | 127    | 127  | 127  |
| <b>Indoor Fan speeds</b>                                       |        |      |      |
| IFVLOWC  | 700    | 700  | 700  |
| IFLOWC   | 750    | 800  | 750  |
| IFMEDC   | 900    | 1000 | 950  |
| IFHIGHC  | 1050   | 1150 | 1150 |
| IFTURBOC   | 1200   | 1250 | 1250 |
| IFVLOWH  | 700    | 700  | 700  |
| IFLOWH   | 850    | 900  | 900  |
| IFMEDH   | 950    | 1000 | 1050 |
| IFHIGHH  | 1100   | 1200 | 1200 |
| IFTURBOH   | 1250   | 1350 | 1300 |
| <b>Nominal Compressor Frequency</b>                            |        |      |      |
| NomLoadC   | 44     | 51   | 62   |
| NomLoadH   | 53     | 50   | 61   |

### 11.13.2 Outdoor Units SW Parameters

For S/W 37V3 and lower ( For 453031000R Controller)

| Parameter Name   | GCD007 | GCD009 | GCD012 |
|--|--------|--------|--------|
| <b>Compressor Parameters</b>                                     |        |        |        |
| MinFreqC   | 35     | 35     | 35     |
| MaxFreqC   | 52     | 62     | 70     |
| MinFreqH   | 38     | 35     | 40     |
| MaxFreqH   | 67     | 73     | 66     |
| Step1Freq  | 40     | 43     | 45     |
| Step2Freq  | 50     | 55     | 55     |
| Step3Freq  | 63     | 63     | 65     |
| <b>Frequency limits as a function of outdoor air temperature</b> |        |        |        |
| MaxFreqAsOATC  | 44     | 50     | 60     |
| MaxFreqAsOAT1H   | 53     | 58     | 60     |
| MaxFreqAsOAT2H   | 45     | 50     | 50     |
| <b>Compressor Over Heating Protection</b>                        |        |        |        |
| CTTOH1   | 94     | 94     | 94     |
| CTTOH2   | 98     | 98     | 98     |
| CTTOH3   | 102    | 102    | 102    |
| CTTOH4   | 105    | 105    | 105    |
| CTTOH5   | 120    | 120    | 120    |
| <b>Compressor Over Current Protection [A]</b>                    |        |        |        |
| CCR01  | 40     | 40     | 40     |
| CCR02  | 42     | 42     | 42     |
| CCR03  | 44     | 44     | 44     |
| CCR04  | 47     | 47     | 47     |
| <b>Outdoor Fan Speed (RPM)</b>                                   |        |        |        |
| OFLOWC   | 610    | 600    | 600    |
| OFMEDC   | 700    | 760    | 760    |

For S/W 370V and higher (For 467300225R Controller)

| Parameter Name   | GC 7 RC DCI<br>(EEV) | GC 9 RC DCI<br>(EEV) | GC 12 RC DCI<br>(EEV) | GCD009<br>(Capillary) | GCD012<br>(Capillary) |
|--|----------------------|----------------------|-----------------------|-----------------------|-----------------------|
| <b>Compressor Parameters</b>                                     |                      |                      |                       |                       |                       |
| MinFreqC   | 20                   | 20                   | 20                    | 20                    | 20                    |
| MaxFreqC   | 52                   | 70                   | 75                    | 65                    | 78                    |
| MinFreqH   | 25                   | 25                   | 25                    | 28                    | 28                    |
| MaxFreqH   | 67                   | 75                   | 75                    | 67                    | 75                    |
| Step1Freq  | 37                   | 37                   | 37                    | 37                    | 37                    |
| Step2Freq  | 46                   | 46                   | 46                    | 46                    | 46                    |
| Step3Freq  | 60                   | 60                   | 65                    | 60                    | 65                    |
| <b>Frequency limits as a function of outdoor air temperature</b> |                      |                      |                       |                       |                       |
| MaxFreqAsOATC  | 52                   | 70                   | 75                    | 65                    | 78                    |
| MaxFreqAsOAT1H   | 60                   | 65                   | 65                    | 60                    | 65                    |
| MaxFreqAsOAT2H   | 40                   | 40                   | 40                    | 40                    | 40                    |
| <b>Compressor Over Heating Protection</b>                        |                      |                      |                       |                       |                       |
| CTTOH1   | 94                   | 94                   | 94                    | 94                    | 94                    |
| CTTOH2   | 98                   | 98                   | 98                    | 98                    | 98                    |
| CTTOH3   | 102                  | 102                  | 102                   | 102                   | 102                   |
| CTTOH4   | 105                  | 105                  | 105                   | 105                   | 105                   |
| <b>Compressor Over Current Protection [A]</b>                    |                      |                      |                       |                       |                       |
| CCR01  | 28                   | 35                   | 40                    | 36                    | 36                    |
| CCR02  | 30                   | 37                   | 42                    | 39                    | 39                    |
| CCR03  | 32                   | 39                   | 44                    | 42                    | 42                    |
| CCR04  | 35                   | 42                   | 47                    | 46                    | 46                    |
| <b>Outdoor Fan Speed (RPM)</b>                                   |                      |                      |                       |                       |                       |
| OFC  | 700                  | 760                  | 760                   | 830                   | 830                   |

### 11.13.3 Remote Control DIP Switch Settings

| DEFINITION                                     |                             | SETTING SWITCH STATUS |           |           |           |
|--|-----------------------------|-----------------------|-----------|-----------|-----------|
| RC4  | RC3                         | SW. NO. 4             | SW. NO. 3 | SW. NO. 2 | SW. NO. 1 |
| RC-ALL MODES OF OPERATION                      |                             | --                    | --        | OFF       | OFF       |
| STD-COOL, FAN, DRY, ACTIVE                     |                             | --                    | --        | OFF       | ON        |
| HEAT-COOL, FAN, DRY, ACTIVE                    |                             | --                    | --        | ON        | OFF       |
| AUTO FAN (AF)                                  |                             | --                    | --        | ON        | ON        |
| VERTICAL SWING ONLY                            | TEMP. DISPLAY IN °C DEGREES | --                    | OFF       | --        | --        |
| HORIZONTAL & VERTICAL SWING FUNCTIONS TOGETHER | TEMP. DISPLAY IN °F DEGREES | --                    | ON        | --        | --        |
| DISABLE LCD & KEY ILLUMINATION                 | TIMER & CLOCK 12H AM, PM    | OFF                   | --        | --        | --        |
| ENABLE LCD & KEY ILLUMINATION                  | TIMER & CLOCK 24H           | ON                    | --        | --        | --        |

Reset operation - Press the 4 buttons simultaneously: "CLEAR ", "SET", "HR +", "HR -" for 5 seconds

#### LEGEND

SW1, SW2 - Selection of RC/ST

SW3 – Selection of Display °C or °F in RC3 or swing function in RC4

SW4 – Selection of Time Display 12H AM/PM or 24H in RC3 or illumination in RC4

OFF = 0

ON = 1

#### NOTE

After setting the DIP switches perform reset operation.



## 12. TROUBLESHOOTING [HAD007, HAD009, HAD012]

### 12.1 ELECTRICAL & CONTROL TROUBLESHOOTING

#### **WARNING!!!**

When Power Up – the whole outdoor unit controller, including the wiring, is under HIGH VOLTAGE!!!

Never open the Outdoor unit before turning off the Power!!!

When turned off, the system is still charged (400V)!!!

It takes about 4 Min. to discharge the system.

Touching the controller before discharging may cause an electrical shock!!!

**For safe handling of the controller please refer to section 15.1.6 below.**

#### 12.1.1 Single Split system failures and corrective actions

| No | SYMPTOM   | PROBABLE CAUSE                                     | CORRECTIVE ACTION  |
|----|---|--|--|
| 1  | Power supply indicator (Red LED) does not light up.   | No power supply                                    | Check power supply. If power supply is OK, check display and display wiring. if OK, replace controller.  |
| 2  | Unit does not respond to remote control message   | Remote control message not reached the indoor unit | Check remote control batteries, if batteries are OK, check display and display wiring, if OK, replace display PCB.<br>If still not OK replace controller.  |
| 3  | Unit responds to remote control message but Operate indicator (Green LED) does not light up       | Problem with display PCB                           | Replace display PCB.<br>If still not OK replace controller.  |
| 4  | Indoor fan does not start (louvers are opened and Green LED does light up)                        | Unit in heat mode and coil is still not warm.      | Change to cool mode and check.   |
|    |   | Problem with PCB or capacitor                      | Change to high speed and Check power supply to motor is higher than 130VAC (for triack controlled motor) or higher than 220VAC for fixed speed motors, if OK replace capacitor, if not OK replace controller |
| 5  | Indoor fan works when unit is OFF, and indoor fan speed is not changed by remote control command. | PCB problem  | Replace controller   |
| 6  | Compressor does not start   | Electronics control problem or protection          | Perform diagnostics (See 15.1.3 below), and follow the actions described.  |
| 7  | Compressor stops during operation and Green LED remains on  | Electronic control or power supply problem         | Perform diagnostics (See 15.1.3 below), and follow the actions described.  |

| No | SYMPTOM   | PROBABLE CAUSE                                  | CORRECTIVE ACTION   |
|----|---|---|---|
| 8  | Compressor is on but outdoor fan does not work                                  | Problem with outdoor electronics or outdoor fan | Check outdoor fan motor according to the procedure in section 15.1.5.3 below, if not OK replace controller                |
| 9  | Unit works in wrong mode (cool instead of heat or heat instead of cool)         | Electronics or power connection to RV           | Check RV power connections, if OK, Check RV operation with direct 230VAC power supply, if OK, Replace outdoor controller. |
| 10 | All components are operating properly but no cooling or no heating              | Refrigerant leak                                | Check refrigeration system.   |
| 11 | Compressor is over heated and unit does not generate capacity                   | EEV problem                                     | Check EEV   |
| 12 | Units goes into protections and compressor is stopped with no clear reason      | Control problem or refrigeration system problem | Perform diagnostics (See 15.1.3 below), and follow the actions described.   |
| 13 | Compressor motor is generating noise and no suction occurs                      | Phase order to compressor is wrong              | Check compressor phase order.   |
| 14 | Water leakage from indoor unit  | Indoor unit drainage tube is blocked            | Check and open drainage tube.   |
| 15 | Freezing of outdoor unit in heat mode and outdoor unit base is blocked with ice |   | Connect base heater.  |
| 16 | Unit operates with wrong fan speeds or wrong frequency                          | Wrong jumper settings                           | Perform diagnostics (See 15.1.3 below), and check if units is operating by EEPROM parameters.                             |

### 12.1.2 Checking the refrigeration system

Checking system pressures and other thermodynamic measures should be done when system is in Test Mode (in Test mode, system operates in fixed settings). The performance curves given in this manual are given for unit performance in test mode when high indoor fan speed is selected.

Entering test mode:

Set unit to Cool/16 degrees/High indoor fan speed, or Heat/30 degrees/High indoor fan speed, and enter diagnostics.

### 12.1.3 Judgment by Indoor/Outdoor Unit Diagnostics

Enter diagnostics mode - press for five seconds Mode/Reset button in any operation mode. Acknowledgment is by 3 short beeps and lights of all Display LED's. Then, The units will enter into Indoor and Outdoor unit diagnostic modes.

During the Outdoor unit diagnostics all three Indoor LED's (STBY/Operate, Filter and Timer) are blinking. When Indoor diagnostics is displayed, all three LED's (STBY/Operate, Filter and Timer) are ON.

When system enters diagnostics mode, only one fault code is shown. Order of priority is from the lower to the higher number. Diagnostics is continuously ON as long as power is ON. The current system operation mode will not be changed.



If no fault occurred in the system, no fault code will be displayed during normal operation mode. The last fault code will be displayed even if the system has recovered from that fault. The last fault will be deleted from the EEPROM after the system has exit diagnostics mode.

In diagnostics mode, system fault / status will be indicated by blinking of Filter & Timer LEDs.

The coding method will be as follows:

Filter LED will blink 5 times in 5 seconds, and then will be shut off for the next 5 seconds.

Timer LED will blink during the same 5 seconds according to the following Indoor / Outdoor unit tables:

Note: 0 – OFF, 1-ON

### 15.1.3.1 Indoor unit Diagnostics

| No  | Problem                                  | AO  | 5 | 4 | 3 | 2 | 1 |
|-----|--|-----|---|---|---|---|---|
| 1   | ICT is disconnected                      | Yes | 0 | 0 | 0 | 0 | 1 |
| 2   | ICT is shorted                           | Yes | 0 | 0 | 0 | 1 | 0 |
| 3   | RAT is disconnected                      | Yes | 0 | 0 | 0 | 1 | 1 |
| 4   | RAT is shorted                           | Yes | 0 | 0 | 1 | 0 | 0 |
| 5   | Reserved (for MSMP used as RGT fault)    | No  | 0 | 0 | 1 | 0 | 1 |
| 6   | ICTE shorted/disconnected (when enabled) | Yes | 0 | 0 | 1 | 1 | 0 |
| 7   | Undefined IDU Family/Model               | Yes | 0 | 0 | 1 | 1 | 1 |
| 8   | No Communication                         | Yes | 0 | 1 | 0 | 0 | 0 |
| 9   | No Encoder                               | No  | 0 | 1 | 0 | 0 | 1 |
| 10  | Reserved                                 | No  | 0 | 1 | 0 | 1 | 0 |
| 11  | Outdoor Unit Fault                       | No  | 0 | 1 | 0 | 1 | 1 |
| ... | Reserved                                 | No  |   |   |   |   |   |
| 17  | Defrost protection                       | No  | 1 | 0 | 0 | 0 | 1 |
| 18  | Deicing Protection                       | No  | 1 | 0 | 0 | 1 | 0 |
| 19  | Outdoor Unit Protection                  | No  | 1 | 0 | 0 | 1 | 1 |
| 20  | Indoor Coil HP Protection                | No  | 1 | 0 | 1 | 0 | 0 |
| 21  | Overflow Protection                      | Yes | 1 | 0 | 1 | 0 | 1 |
| 22  | Reserved                                 | No  |   |   |   |   |   |
| 24  | EEPROM Not Updated                       | No  | 1 | 1 | 0 | 0 | 0 |
| 25  | Bad EEPROM                               | No  | 1 | 1 | 0 | 0 | 1 |
| 26  | Bad Communication                        | No  | 1 | 1 | 0 | 1 | 0 |
| 27  | Using EEPROM data                        | No  | 1 | 1 | 0 | 1 | 1 |
| 28  | Model A                                  | No  | 1 | 1 | 1 | 0 | 0 |
| 29  | Model B                                  | No  | 1 | 1 | 1 | 0 | 1 |
| 30  | Model C                                  | No  | 1 | 1 | 1 | 1 | 0 |
| 31  | Model D                                  | No  | 1 | 1 | 1 | 1 | 1 |

Yes

AO => Alarm Operation

**15.1.3.2 Indoor unit diagnosis and corrective actions**

| No. | Fault                        | Probable Cause   | Corrective Action   |
|-----|------------------------------|--|---|
| 1   | Sensor failures of all types |  | Check sensor connections or replace sensor  |
| 2   | Communication mismatch       | Indoor and Outdoor controllers are with different versions | Replace Indoor controller   |
| 3   | No Communication             | Communication or grounding wiring is not good.             | Check Indoor to Outdoor wiring and grounding  |
| 4   | No Encoder                   | Indoor electronics or motor                                | Check motor wiring, if ok, replace motor, if still not ok, replace Indoor controller. |
| 5   | Outdoor Unit Fault           | Outdoor controller problem                                 | Switch to Outdoor diagnostics.  |
| 6   | EEPROM Not Updated           | System is using ROM parameters and not EEPROM parameters   | No action, unless special parameters are required for unit operation.                 |
| 7   | Bad EEPROM                   |  | No action, unless special parameters are required for unit operation.                 |
| 8   | Bad Communication            | Communication quality is low reliability                   | Check Indoor to Outdoor wiring and grounding  |
| 9   | Using EEPROM data            | No problem. System is using EEPRRRROM parameters           |   |

### 15.1.3.3 Outdoor unit Diagnostics

| No  | Problem                                      | 5 | 4 | 3 | 2 | 1 |
|-----|--|---|---|---|---|---|
| 1   | OCT is disconnected                          | 0 | 0 | 0 | 0 | 1 |
| 2   | OCT is shorted                               | 0 | 0 | 0 | 1 | 0 |
| 3   | CTT is disconnected                          | 0 | 0 | 0 | 1 | 1 |
| 4   | CTT is shorted                               | 0 | 0 | 1 | 0 | 0 |
| 5   | HST is disconnected (when enabled)           | 0 | 0 | 1 | 0 | 1 |
| 6   | HST is shorted (when enabled)                | 0 | 0 | 1 | 1 | 0 |
| 7   | OAT is disconnected (when enabled)           | 0 | 0 | 1 | 1 | 1 |
| 8   | OAT is shorted (when enabled)                | 0 | 1 | 0 | 0 | 0 |
| 9   | TSUC is disconnected (when enabled)          | 0 | 1 | 0 | 0 | 1 |
| 10  | TSUC is shorted (when enabled)               | 0 | 1 | 0 | 1 | 0 |
| 11  | IPM Fault                                    | 0 | 1 | 0 | 1 | 1 |
| 12  | Bad EEPROM                                   | 0 | 1 | 1 | 0 | 0 |
| 13  | DC under voltage                             | 0 | 1 | 1 | 0 | 1 |
| 14  | DC over voltage                              | 0 | 1 | 1 | 1 | 0 |
| 15  | AC under voltage                             | 0 | 1 | 1 | 1 | 1 |
| 16  | Indoor / Outdoor unit Communication mismatch | 1 | 0 | 0 | 0 | 0 |
| 17  | No Communication                             | 1 | 0 | 0 | 0 | 1 |
| 18  | Reserved                                     | 1 | 0 | 0 | 1 | 0 |
| 20  | Heat sink Over Heating                       | 1 | 0 | 1 | 0 | 0 |
| 21  | Deicing                                      | 1 | 0 | 1 | 0 | 1 |
| 22  | Compressor Over Heating                      | 1 | 0 | 1 | 1 | 0 |
| 23  | Compressor Over Current                      | 1 | 0 | 1 | 1 | 1 |
| ... | Reserved                                     |   |   |   |   |   |
| 27  | Bad Communication                            | 1 | 1 | 0 | 1 | 1 |

### 15.1.3.4 Outdoor unit diagnosis and corrective actions

For S/W 37V3 and lower ( For 453031000R Controller)

| No. | Fault  | Probable Cause   | Corrective Action   |
|-----|--|--|---|
| 1   | Sensors failures of all types                |  | Check sensors connections or replace sensors.                         |
| 2   | IPM Fault                                    | Electronics HW problem                                     | Check all wiring and jumper settings, if OK, replace electronics.     |
| 3   | Bad EEPROM                                   |  | No action, unless special parameters are required for unit operation. |
| 4   | DC under/over Voltage                        | Electronics HW problem                                     | Check outdoor unit power supply voltage                               |
| 5   | AC under Voltage                             |  | Check outdoor unit power supply voltage                               |
| 6   | Indoor / Outdoor unit Communication mismatch | Indoor and Outdoor controllers are with different versions | Replace Indoor controller   |
| 7   | No Communication                             | Communication or grounding wiring is not good.             | Check Indoor to Outdoor wiring and grounding                          |
| 8   | Compressor Lock                              |  | Switch unit to STBY and restart                                       |
| 9   | Bad Communication                            | Communication quality is low reliability                   | Check Indoor to Outdoor wiring and grounding                          |

For S/W 370V and higher (For 467300225R Controller)

| No | Problem   | AO  | 5 | 4 | 3 | 2 | 1 |
|----|---|-----|---|---|---|---|---|
| 1  | OCT shorted/disconnected                            | Yes | 0 | 0 | 0 | 0 | 1 |
| 2  | CTT shorted/disconnected                            | Yes | 0 | 0 | 0 | 1 | 0 |
| 3  | HST shorted/disconnected                            | Yes | 0 | 0 | 0 | 1 | 1 |
| 4  | OAT shorted/disconnected                            | Yes | 0 | 0 | 1 | 0 | 0 |
| 5  | OMT shorted/disconnected                            | Yes | 0 | 0 | 1 | 0 | 1 |
| 6  | Reserved (for Multi Split RGT shorted/disconnected) | No  | 0 | 0 | 1 | 1 | 0 |
| 7  | Reserved (for Multi Split RLT shorted/disconnected) | No  | 0 | 0 | 1 | 1 | 1 |
| 8  | Reserved  | No  | 0 | 1 | 0 | 0 | 0 |
| 9  | Reserved  | No  | 0 | 1 | 0 | 0 | 1 |
| 10 | Reserved  | No  | 0 | 1 | 0 | 1 | 0 |
| 11 | IPM Fault   | Yes | 0 | 1 | 0 | 1 | 1 |
| 12 | Reserved  | No  | 0 | 1 | 1 | 0 | 0 |
| 13 | DC under voltage                                    | Yes | 0 | 1 | 1 | 0 | 1 |
| 14 | Reserved  | No  | 0 | 1 | 1 | 1 | 0 |
| 15 | Zero Crossing detection fault                       | Yes | 0 | 1 | 1 | 1 | 1 |
| 16 | Mismatch between IDU & ODU models                   | Yes | 1 | 0 | 0 | 0 | 0 |
| 17 | No Communication                                    | Yes | 1 | 0 | 0 | 0 | 1 |
| 18 | Reserved  | No  | 1 | 0 | 0 | 1 | 0 |
| 20 | Heat sink Over Heating                              | No  | 1 | 0 | 1 | 0 | 0 |
| 21 | Deicing   | No  | 1 | 0 | 1 | 0 | 1 |
| 22 | Compressor Over Heating                             | No  | 1 | 0 | 1 | 1 | 0 |
| 23 | Compressor Over Current                             | No  | 1 | 0 | 1 | 1 | 1 |
| 24 | Reserved  | No  | 1 | 1 | 0 | 0 | 0 |
| 25 | Reserved  | No  | 1 | 1 | 0 | 0 | 1 |
| 26 | Compressor Lock                                     | Yes | 1 | 1 | 0 | 1 | 0 |
| 27 | Bad Communication                                   | No  | 1 | 1 | 0 | 1 | 1 |
| 28 | Missing ODU configuration                           | Yes | 1 | 1 | 1 | 0 | 0 |
| 29 | Undefined ODU Model                                 | Yes | 1 | 1 | 1 | 0 | 1 |
| 30 | Outdoor Coil Overheating                            | No  | 1 | 1 | 1 | 1 | 0 |
| 31 | Operation condition is exceeded                     | Yes | 1 | 1 | 1 | 1 | 1 |

☐ Yes AO => Alarm Operation

#### 12.1.4 Judgement by MegaTool

MegaTool is a special tool to monitor the system states.

Using MegaTool requires:

- A computer with RS232C port.
- A connection wire for MegaTool.
- A special MegaTool software.

Use MegaTool according to following procedure:

- Setup MegaTool software: copy the software to the computer.
- Connect RS232C port in computer with MegaTool port in Indoor/Outdoor unit controller by the connection wire.
- Run the software and choose the COM port, you can monitor the A/C system state in monitor tab.

### **12.1.5 Simple procedures for checking the Main Parts**

#### **12.1.5.1 Checking Mains Voltage.**

Confirm that the Mains voltage is between 198 and 264 VAC. If Mains voltage is out of this range, abnormal operation of the system is expected. If in range check the Power (Circuit) Breaker and look for broken or loosed cable lugs or wiring mistake(s).

#### **12.1.5.2 Checking Power Input.**

If Indoor unit power LED is unlighted, power down the system and check the fuse of the Indoor unit. If the fuse is OK replace the Indoor unit controller. If the fuse has blown, replace the fuse and power up again.

Checking Power Input procedure for the Outdoor unit is the same as with the Indoor unit.

#### **12.1.5.3 Checking the Outdoor Fan Motor.**

Enter Test Mode (where the OFAN speed is high)

Check the voltage between lead wires according to the normal value as following:

- Between red wire and black wire: 310VDC +/- 20V
- Between orange wire and black wire: 15VDC +/- 1V
- Between yellow wire and black wire: 2-6VDC

#### **12.1.5.4 Checking the Compressor.**

The compressor is brushless permanence magnetic DC motor. Three coil resistance is same. Check the resistance between three poles. The normal value should be below 0.5 ohm (TBD).

#### **12.1.5.5 Checking the Reverse Valve (RV).**

Running in heating mode, check the voltage between two pins of reverse valve connector, normal voltage is 220VAC.

#### **15.1.5.1 Checking the electrical expansion valve (EEV).**

The EEV has two parts, drive part and valve. The drive part is a step motor; it is ringed on the valve. Check the drive voltage (12VDC). When Outdoor unit is power on, EEV shall run and have click and vibration.

### **12.1.6 Precaution, Advise and Notice Items**

#### **12.1.6.1 High voltage in Outdoor unit controller.**

Whole controller, including the wires that are connected to the Outdoor unit controller may have the potential hazard voltage when power is on. Touching the Outdoor unit controller may cause an electrical shock.

**Advise:** Don't touch the naked lead wire and don't insert finger, conductor or anything else into the controller when power is on.

#### **12.1.6.2 Charged Capacitors**

Three large-capacity electrolytic capacitors are used in the Outdoor unit controller. Therefore, charging voltage (380VDC) remains after power down. Discharging takes about four minutes after power is off. Touching the Outdoor unit controller before discharging may cause an electrical shock.

#### **12.1.6.3 Additional advises**

- When disassemble the controller or the front panel, turn off the power supply.
- When connecting or disconnecting the connectors on the PCB, hold the whole housing, don't pull the wire.

There are sharp fringes and sting on shell. Use gloves when disassemble

## 13. CONTROL SYSTEM [HAD018, HAD022]

### 13.1 General Functions and Operating Rules

The DCI software is fully parametric.

All the model dependent parameters are shown in Blue color and with Italic style [*parameter*].

The parameters values are given in the last section of this control logic chapter of the service manual.

#### 13.1.1 System Operation Concept

The control function is divided between indoor and outdoor unit controllers. Indoor unit is the system 'Master', requesting the outdoor unit for cooling/heating capacity supply. The outdoor unit is the system 'Slave' and it must supply the required capacity unless it enters into a protection mode avoiding it from supplying the requested capacity.

The capacity request is transferred via indoor to outdoor communication, and is represented by a parameter called 'NLOAD'. NLOAD is an integer number with values between 0 and 127, and it represents the heat or cool load felt by the indoor unit.

#### 13.1.2 Compressor Frequency Control

##### 13.1.2.1 NLOAD setting

The NLOAD setting is done by the indoor unit controller, based on a PI control scheme.

The actual NLOAD to be sent to the outdoor unit controller, is based on the preliminary LOAD calculation, the indoor fan speed, and the power shedding function.

NLOAD limits as a function of indoor fan speed:

Indoor Fan Speed Maximum NLOAD Cooling Maximum NLOAD Heating

| Indoor Fan Speed | Maximum NLOAD Cooling | Maximum NLOAD Heating |
|------------------|-----------------------|-----------------------|
| Low              | <i>Max NLOADIF1C</i>  | 127                   |
| Medium           | <i>Max NLOADIF2C</i>  | 127                   |
| High             | <i>Max NLOADIF3C</i>  | 127                   |
| Turbo            | <i>Max NLOADIF4C</i>  | 127                   |
| Auto             | <i>Max NLOADIF5C</i>  | 127                   |

LOAD limits as a function of power shedding:

| Mode    | Power Shedding OFF | Power Shedding ON |
|---------|--------------------|-------------------|
| Cooling | No limit           | Nominal Cooling   |
| Heating | No limit           | Nominal heating   |

#### 13.1.3 Target Frequency Setting

The compressor target frequency is a function of the NLOAD number sent from the indoor controller and the outdoor air temperature.

Basic Target Frequency Setting:

| NLOAD            | Target Frequency   |
|------------------|--|
| 127              | <i>Maximum frequency</i>                                 |
| 10 < NLOAD < 127 | Interpolated value between minimum and maximum frequency |
| 10               | <i>Minimum frequency</i>                                 |
| 0                | Compressor is stopped                                    |

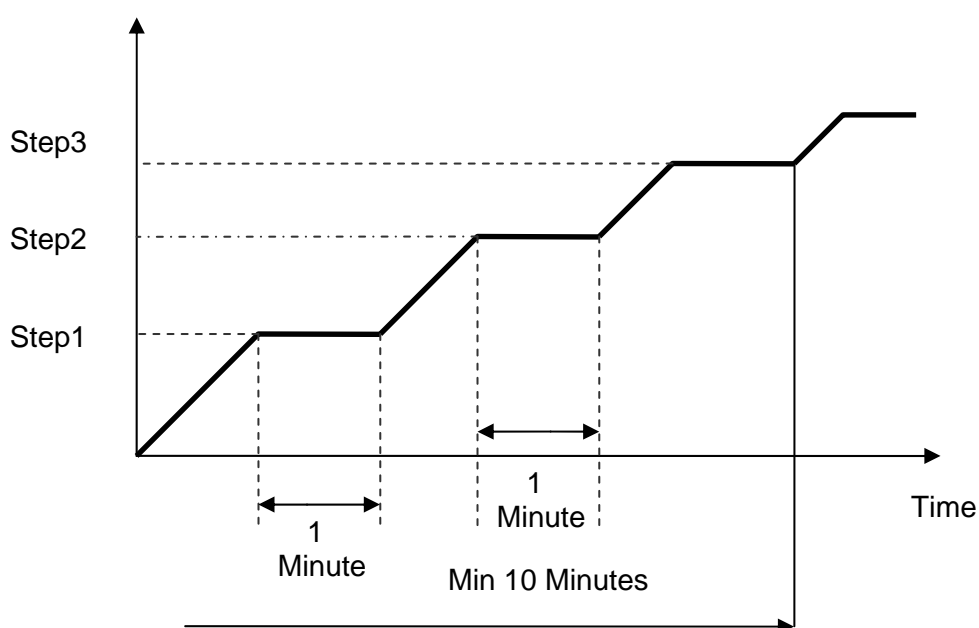
Target frequency limits as a function of outdoor air temperature (OAT):

| OAT Range                 | Cool mode limits     | Heat mode limits      |
|---------------------------|----------------------|-----------------------|
| OAT < 6                   | <i>MaxFreqAsOATC</i> | No limit              |
| $6 \leq \text{OAT} < 15$  |                      | <i>MaxFreqAsOAT1H</i> |
| $15 \leq \text{OAT} < 28$ |                      | <i>MaxFreqAsOAT2H</i> |
| $28 \leq \text{OAT}$      | No limit             |                       |

#### 13.1.4 Frequency Changes Control

Frequency change rate is 1 Hz/sec.

#### 13.1.5 Compressor Starting Control



#### 13.1.6 Minimum On and Off Time

3 minutes.

#### 13.1.7 Indoor Fan Control

10 Indoor fan speeds are determined for each model. 5 speeds for cool/dry/fan modes and 5 speeds for heat mode.

When user sets the indoor fan speed to a fixed speed (Low/ Medium/ High), unit will operate constantly at set speed.

When Auto Fan is selected, indoor unit controller can operate in all speeds. The actual speed is set according to the cool/heat load.

##### 13.1.7.1 Turbo Speed

The Turbo speed is activated during the first 30 minutes of unit operation when auto fan speed is selected and under the following conditions:

- Difference between set point and actual room temperature is bigger then 3 degrees.
- Room temperature > 22 for cooling, or < 25 for heating.

### 13.1.8 Heating Element Control

Heating element can be started if  $LOAD > 0.8 * MaximumNLOAD$  AND Indoor Coil temperature  $< 45$ .

The heating element will be stopped when  $LOAD < 0.5 * MaximumNLOAD$  OR if Indoor Coil temperature  $> 50$ .

### 13.1.9 Outdoor Fan Control

7 outdoor fan speeds are determined for each model. 3 speeds for cool and dry modes, and 3 speeds for heat mode, and a very low speed.

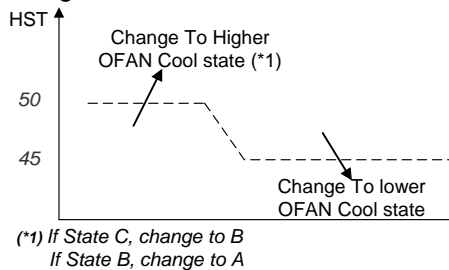
Outdoor fan speed is a function of compressor frequency and outdoor air temperature (OAT).

4 routines for fan control are determined. The control routine selection depends on operation mode, compressor speed, outdoor air temperature (OAT) and heat sink temperature (HST).

| Routine  | Conditions   |
|----------|--|
| <b>A</b> | Heating with $OAT < 15^{\circ}C$ or<br>Cooling with $OAT > 20^{\circ}C$ , or<br>Faulty OAT |
| <b>B</b> | Cooling with $20^{\circ}C > OAT > 7^{\circ}C$  |
| <b>C</b> | Cooling with $7^{\circ}C > OAT$  |
| <b>D</b> | Heating with $OAT > 15^{\circ}C$   |

| Compressor<br>Target Frequency    | OFAN Speed                             |                    |                    |                                |
|-----------------------------------|--|--------------------|--------------------|--------------------------------|
|                                   | Normal cases<br>State A at cool / Heat | State B<br>at cool | State C<br>at cool | $OAT > 15^{\circ}C$<br>at heat |
| Freq=0                            | OFF                                    | OFF                | OFF                | OFF                            |
| $10 \leq Freq < OFLowFreq$        | Low                                    | Low                | Low                | Low                            |
| $OFLowFreq \leq Freq < OFMedFreq$ | High                                   | Low                | Low                | Low                            |
| $OFMedFreq \leq Freq$             | High                                   | Low                | Low                | High                           |

In cooling mode, the extra rule is as the below;



When compressor is switched to OFF and the heat sink temperature is above 55 degrees, the outdoor fan will remain ON in low speed for up to 3 minutes.

### 13.1.10 EEV (electronic Expansion valve) Control

EEV opening is defined as  $EEV = EEV_{OL} + EEV_{CV}$

$EEV_{OL}$  is the initial EEV opening as a function of the compressor frequency, operation mode, unit model and capacity.

$EEV_{CV}$  is a correction value for the EEV opening that is based on the compressor temperature.

During the first 5 minutes of compressor operation  $EEV_{CV} = 0$ .

Once the first 5 minutes are over, the correction value is calculated as follow:  $EEV_{CV}(n) = EEV_{CV}(n-1) + EEV_{CTT}$

$EEV_{CTT}$  is the correction based on the compressor temperature. A target compressor temperature is set depending on frequency and outdoor air temperature, and the actual compressor temperature is compared to the target temperature to set the required correction to the EEV opening.



### 13.1.11 Reversing Valve (RV) Control

Reversing valve is on in heat mode.

Switching of RV state is done only after compressor is off for over 3 minutes.

### 13.1.12 Ionizer Control

Ionizer is on when unit is on AND indoor fan is on AND Ionizer power switch (on Ionizer) is on.

## 13.2 Fan Mode

In high/ medium/ low indoor fan user setting, unit will operate fan in selected speed.

In AutoFan user setting, fan speed will be adjusted automatically according to the difference between actual room temperature and user set point temperature.

## 13.3 Cool Mode

NLOAD is calculated according to the difference between actual room temperature and user set point temperature by PI control.

In high/ medium/ low indoor fan user setting, unit will operate fan in selected speed.

In AutoFan user setting, fan speed will be adjusted automatically according to the calculated NLOAD.

## 13.4 Heat Mode

NLOAD is calculated according to the difference between actual room temperature and user set point temperature by PI control.

In high/ medium/ low indoor fan user setting, unit will operate fan in selected speed.

In AutoFan user setting, fan speed will be adjusted automatically according to the calculated NLOAD.

### 13.4.1 Temperature Compensation

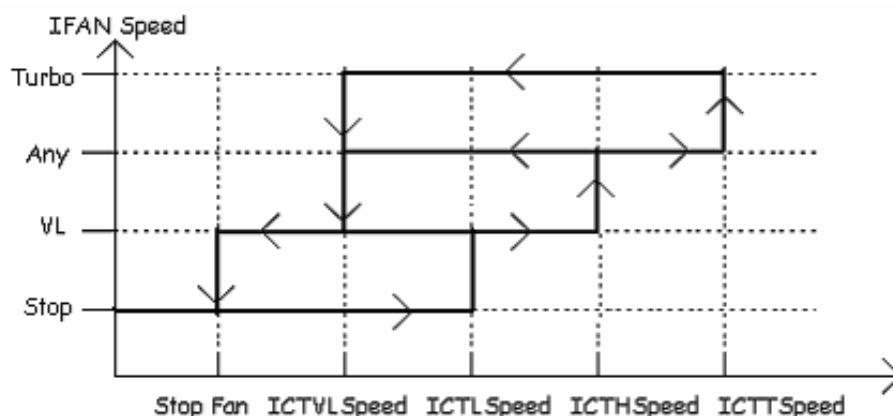
In wall mounted, ducted, and cassette models, 3 degrees are reduced from room temperature reading (except when in I-Feel mode), to compensate for temperature difference between high and low areas in the heated room, and for coil heat radiation on room thermistor.

The temperature compensation can be enabled/disabled by shortening of **J2** on the indoor unit Controller.

| Model         | J2 Shorted            | J2 Opened             |
|---------------|-----------------------|-----------------------|
| Wall mounted  | Compensation Disabled | Compensation Enabled  |
| Cassette      | Compensation Enabled  | Compensation Disabled |
| Ducted        | Compensation Enabled  | Compensation Disabled |
| Floor/Ceiling | Compensation Disabled | Compensation Enabled  |

### 13.4.2 Indoor Fan Control in Heat Mode

Indoor fan speed depends on the indoor coil temperature:



### 13.5 Auto Cool/Heat Mode

When in auto cool heat mode unit will automatically select between cool and heat mode according to the difference between actual room temperature and user set point temperature ( $\Delta T$ ).

Unit will switch from cool to heat when compressor is off for 3 minutes, and  $\Delta T < -3$ .

Unit will switch from heat to cool when compressor is off for 5 minutes, and  $\Delta T < -3$ .

### 13.6 Dry Mode

As long as room temperature is higher then the set point, indoor fan will work in low speed and compressor will work between 0 and  $MaxNLOADIF1C$  Hz.

When the room temperature is lower than the set point, compressor will be switched OFF and indoor fan will cycle 3 minutes OFF, 1 minute ON.

### 13.7 Protections

There are 5 protection codes.

Normal (Norm) – unit operate normally.

Stop Rise (SR) – compressor frequency can not be raised but does not have to be decreased.

HzDown1 (D1) – Compressor frequency is reduced by 2 to 5 Hz per minute.

HzDown2 (D2) – Compressor frequency is reduced by 5 to 10 Hz per minute.

Stop Compressor (SC) – Compressor is stopped.

#### 13.7.1 Indoor Coil Defrost Protection

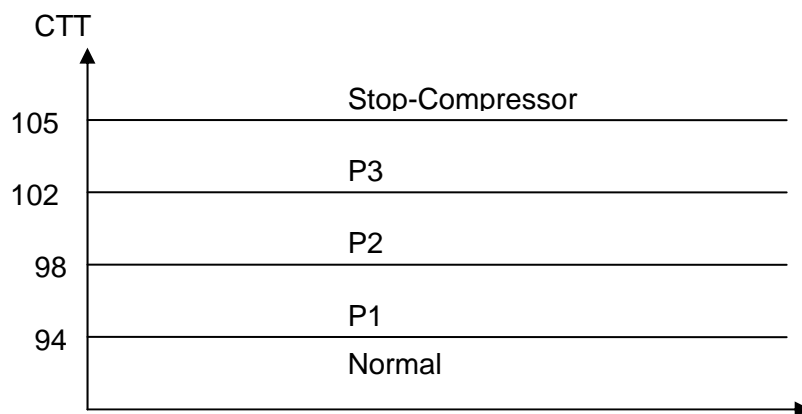
| ICT               | ICT Trend       |            |           |            |                 |
|-------------------|-----------------|------------|-----------|------------|-----------------|
|                   | Fast Increasing | Increasing | No change | Decreasing | Fast Decreasing |
| $ICT < -2$        | SC              | SC         | SC        | SC         | SC              |
| $-2 \leq ICT < 0$ | D1              | D1         | D2        | D2         | D2              |
| $0 \leq ICT < 2$  | SR              | SR         | D1        | D2         | D2              |
| $2 \leq ICT < 4$  | SR              | SR         | SR        | D1         | D2              |
| $4 \leq ICT < 6$  | Norm            | Norm       | SR        | SR         | D1              |
| $6 \leq ICT < 8$  | Norm            | Norm       | Norm      | SR         | SR              |
| $8 \leq ICT$      | Normal          |            |           |            |                 |

### 13.7.2 Indoor Coil over Heating Protection

| ICT                | ICT Trend       |            |           |            |                 |
|--------------------|-----------------|------------|-----------|------------|-----------------|
|                    | Fast Decreasing | Decreasing | No Change | Increasing | Fast Increasing |
| $ICT > 55$         | SC              | SC         | SC        | SC         | SC              |
| $53 < ICT \leq 55$ | D1              | D1         | D2        | D2         | D2              |
| $49 < ICT \leq 53$ | SR              | SR         | D1        | D2         | D2              |
| $47 < ICT \leq 49$ | SR              | SR         | SR        | D1         | D2              |
| $45 < ICT \leq 47$ | Norm            | Norm       | SR        | SR         | D1              |
| $43 < ICT \leq 45$ | Norm            | Norm       | Norm      | SR         | SR              |
| $ICT \leq 43$      | Normal          |            |           |            |                 |

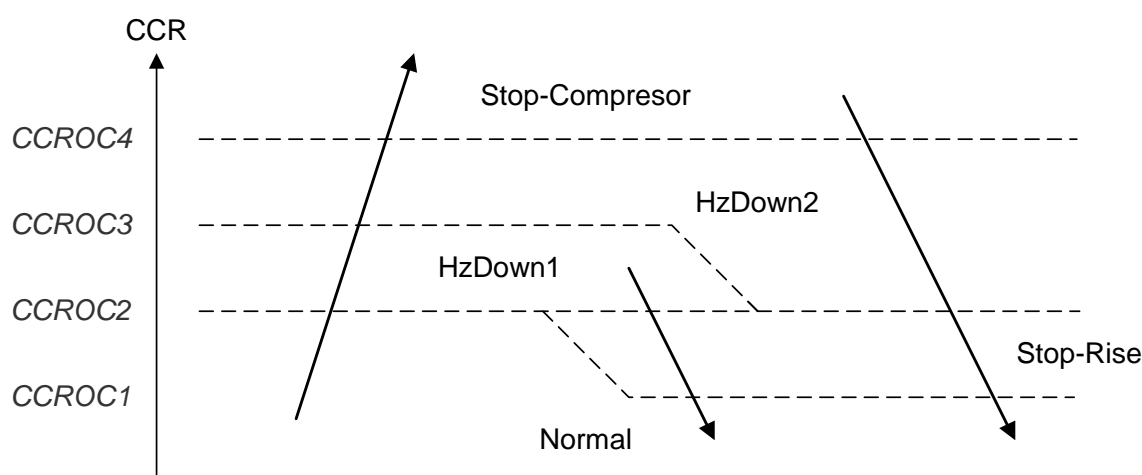
### 13.7.3 Compressor Overheating Protection

Compressor temperature can be in one of 5 control zones (4 in protection, and 1 normal), according to the following chart.



| Control Status  | Compressor Temperature Increases | Else |
|-----------------|----------------------------------|------|
| P1              | Norm                             | SR   |
| P2              | D1                               | SR   |
| P3              | D2                               | D1   |
| Stop Compressor | SC                               |      |

### 13.7.4 Compressor over Current Protection



### 13.7.5 Heat Sink Over Heating Protection (NA for DCI 25 and 35)

| HST           | HST Trend  |           |            |
|---------------|------------|-----------|------------|
|               | Decreasing | No Change | Increasing |
| HST > 90      | SC         | SC        | SC         |
| 85 < HST ≤ 90 | D1         | D2        | D2         |
| 82 < HST ≤ 85 | SR         | D1        | D2         |
| 80 < HST ≤ 82 | SR         | SR        | D1         |
| 78 < HST ≤ 80 | Norm       | Norm      | SR         |
| HST ≤ 78      | Normal     |           |            |

### 13.7.6 Outdoor Coil Deicing Protection

#### 13.7.6.1 Deicing Starting Conditions

Deicing operation will start when either one of the following conditions exist:

- Case 1: OCT < OAT – 8 AND TLD > DI
- Case 2: OCT < OAT – 12 AND TLD > 30 minutes.
- Case 3: OCT is Invalid AND TLD > DI
- Case 4: Unit is just switched to STBY AND OCT < OAT – 8
- Case 5: NLOAD = 0 AND OCT < OAT – 8
- Case 6: OCT < 19 AND TLD > 60 minutes.

OCT – Outdoor Coil Temperature

OAT – Outdoor Air Temperature

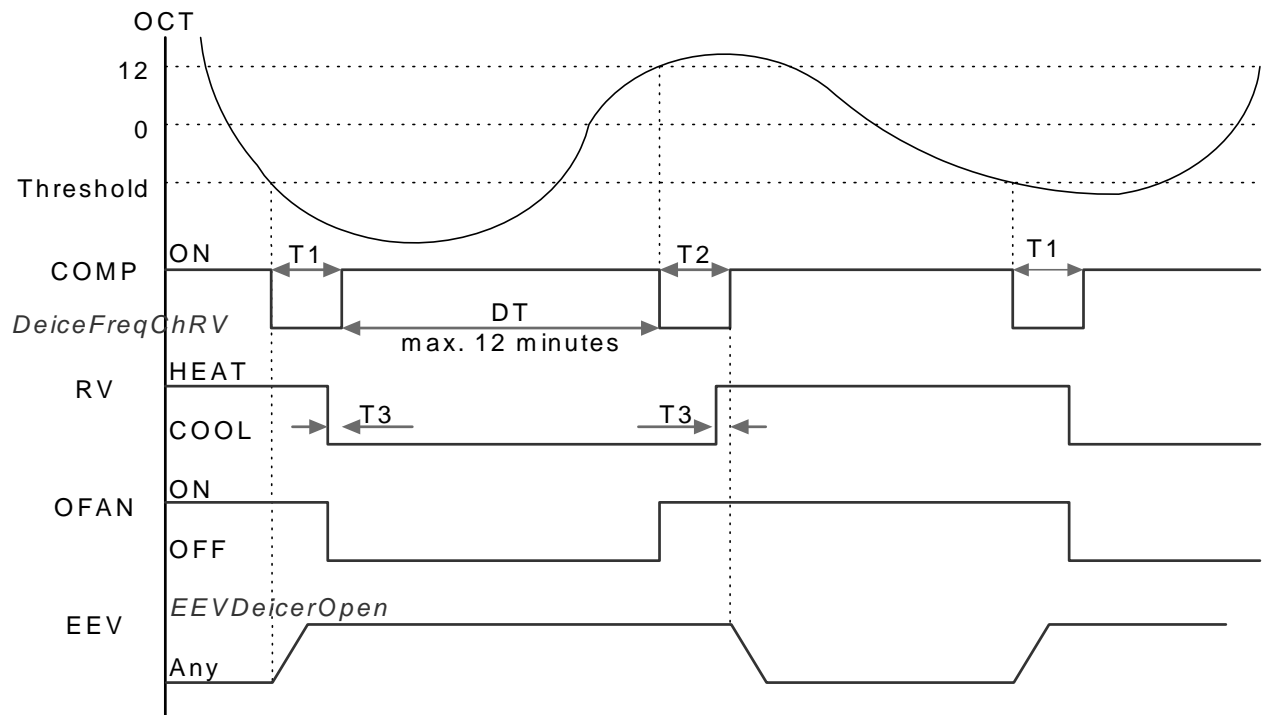
TLD – Time from Last Deicing

DI – Deicing Interval (Time Interval Between Two Deicing)

Deicing interval time when compressor is first started in heat mode, is 10 minutes if OCT < -2, and is 40 minutes in other cases.

Deicing interval time is changed (increased/ decreased in 10 minutes steps) as a function of deicing time. If deicing time is shorter then former deicing time, the deicing interval time will be increased. If deicing time is longer then former deicing time, the deicing interval time will be decreased.

13.7.6.2 Deicing Protection Procedure



T1 =60 seconds, T2 = 36 seconds, T3 = 6 seconds

13.8 Indoor Unit from Dry Contact

Indoor unit Dry contact has two alternative functions that are selected by J9.

|          | Function                     | Contact=open | Contact=short |
|----------|------------------------------|--------------|---------------|
| J9=open  | Presence Detector Connection | No limit     | Force to STBY |
| J9=short | Power Shedding Function      | No limit     | Limit NLOAD   |

13.9 Operating the Unit from the Mode Button

Forced operation allows to start, stop and operate in Cooling or Heating, in pre-set temperature according to the following table:

| Forced operation Mode | Pre-set Temperature |
|-----------------------|---------------------|
| Cooling               | 20°C                |
| Heating               | 28°C                |

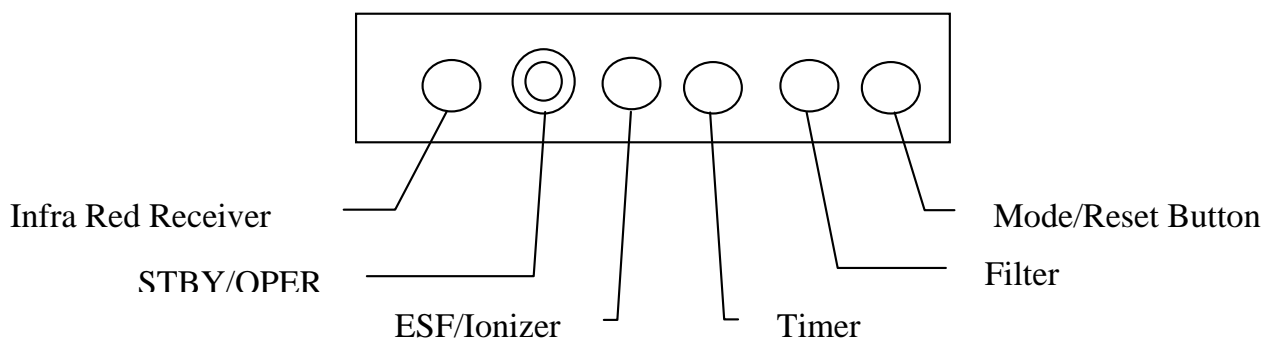
## 13.10 On Unit Controls and Indicators

### 13.10.1 Indoor Unit controller Controls and Indicators

|                            |   |
|----------------------------|---|
| <b>STAND BY INDICATOR</b>  | <ol style="list-style-type: none"> <li>1. Lights up when the Air Conditioner is connected to power and the mode is STBY.</li> <li>2. Blinks for 3 times at 600 msec each cycle, when the system is switched to Heat Mode by using the Mode/Reset Switch on the unit (the operation indicator will be off during this blinking time).</li> </ol>   |
| <b>OPERATION INDICATOR</b> | <ol style="list-style-type: none"> <li>1. Lights up during operation mode (except for item in STBY indicator).</li> <li>2. Blinks for 600 msec. cycle, to announce that a R/C infrared signal has been received and stored.</li> <li>3. Blinks continuously during protections (according to the relevant spec section).</li> <li>4. Blinks for 3 times at 600 msec each cycle when the system is switched to Cool Mode by using the Mode/Reset Switch on the unit</li> </ol>   |
| <b>TIMER INDICATOR</b>     | Lights up during Timer and Sleep operation.   |
| <b>FILTER INDICATOR</b>    | Lights up when Air Filter needs to be cleaned.  |
| <b>Mode/Reset Button</b>   | <p>As long as the filter Led is off, the Mode/Reset button functions as Mode switch. Once filter Led is on, the Mode/Reset button functions as Reset switch.</p> <p><b><u>Mode Function:</u></b></p> <p>Every short pressing , the next operation mode is selected, in this order: SB → Cool Mode → Heat Mode → SB → ... In long pressing system enters diagnostic mode (refer to diagnostic mode Sect.)</p> <p><b><u>Reset Function:</u></b></p> <p>For short pressing:</p> <p>When Filter LED is on, it turns off the filter indicator.</p> |
| <b>ESF</b>                 | Lights up as long as the ESF is on  |

### 13.10.2 Indoor Unit controller Controls and Indications

The following is schematic drawing for the display:



### 13.10.3 Outdoor Unit Controller Indicators

Unit has three LED's. SB LED, STATUS LED, FAULT LED.

SB LED is ON when power is ON (230 VAC),

STATUS LED is ON when COMP is ON, and Blinks according to diagnostics mode definitions when either fault or protection occurs.

FAULT LED Blinks according to diagnostics mode definitions when either fault or protection occurs.

## 13.11 Jumper Settings

### 13.11.1 Indoor Unit Controller

0 = Open Jumper (disconnect jumper).

1 = Close Jumper (connect jumper).

Self test Jumper - J1

| OPERATION | J1 |
|-----------|----|
| SELF TEST | 1  |
| NORMAL    | 0  |

Compensation jumper - J2

| Model      | J2 (Default) | Compensation |
|------------|--------------|--------------|
| HAD018/022 | 1            | Activated    |

Family selection Jumper - J3, J4, J5, J6 and J11

| Family     | J11 | J6 | J5 | J4 | J3 |
|------------|-----|----|----|----|----|
| HAD018/022 | 0   | 1  | 0  | 0  | 0  |

Model selection Jumper - J7

**Controller => HAD018/022**

| Model  | J7 |
|--------|----|
| HAD018 | 0  |
| HAD022 | 1  |

Jumper - J9

| OPERATION         | J9 |
|-------------------|----|
| Presence Detector | 0  |
| Power Shedding    | 1  |

### Jumper - J10

| OPERATION       | J10 |
|-----------------|-----|
| With Ionizer    | 0   |
| Without Ionizer | 1   |

### Jumper - J14

| OPERATION   | J14 |
|-------------|-----|
| LEX Display | 0   |
| HAD Display | 1   |

## 13.11.2 Outdoor Unit Controller

### JP9 Jumper Layout

|                  |              |              |              |              |
|------------------|--------------|--------------|--------------|--------------|
| Reserved (PIN 9) | ODU3 (PIN 7) | ODU2 (PIN 5) | ODU1 (PIN 3) | ODU0 (PIN 1) |
| GND (PIN 10)     | GND (PIN 8)  | GND (PIN 6)  | GND (PIN 4)  | GND (PIN 2)  |

### ODU Model Selection

| ODU3             | ODU2             | ODU1             | ODU0             | ODU Model            |
|------------------|------------------|------------------|------------------|----------------------|
| OFF              | OFF              | OFF              | OFF              | Reserved             |
| OFF              | OFF              | OFF              | ON (PIN1 & PIN2) | A (Single DCI GC 9)  |
| OFF              | OFF              | ON (PIN3 & PIN4) | OFF              | B (Single DCI GC 12) |
| OFF              | OFF              | ON (PIN3 & PIN4) | ON (PIN1 & PIN2) | C (Single DCI GC 18) |
| OFF              | ON (PIN5 & PIN6) | OFF              | OFF              | D (Single DCI GC 21) |
| OFF              | ON (PIN5 & PIN6) | OFF              | ON (PIN1 & PIN2) | E (Duo DCI GC 18)    |
| OFF              | ON (PIN5 & PIN6) | ON (PIN3 & PIN4) | OFF              | F                    |
| OFF              | ON (PIN5 & PIN6) | ON (PIN3 & PIN4) | ON (PIN1 & PIN2) | G                    |
| ON (PIN7 & PIN8) | OFF              | OFF              | OFF              | H                    |
| ON (PIN7 & PIN8) | OFF              | OFF              | ON (PIN1 & PIN2) | I                    |
| ON (PIN7 & PIN8) | OFF              | ON (PIN3 & PIN4) | OFF              | J                    |
| ON (PIN7 & PIN8) | OFF              | ON (PIN3 & PIN4) | ON (PIN1 & PIN2) | K                    |
| ON (PIN7 & PIN8) | ON (PIN5 & PIN6) | OFF              | OFF              | L                    |
| ON (PIN7 & PIN8) | ON (PIN5 & PIN6) | OFF              | ON (PIN1 & PIN2) | M                    |
| ON (PIN7 & PIN8) | ON (PIN5 & PIN6) | ON (PIN3 & PIN4) | OFF              | N                    |
| ON (PIN7 & PIN8) | ON (PIN5 & PIN6) | ON (PIN3 & PIN4) | ON (PIN1 & PIN2) | O                    |

## 13.12 Test Mode

### 13.12.1 Entering Test Mode

System can enter Test mode in two ways:

Automatically when the following conditions exists for 30 minutes continuously: Mode = Cool, Set point = 16, Room temperature =  $27 \pm 1$ , Outdoor temperature =  $35 \pm 1$  Or

Mode = Heat, Set point = 30, Room temperature =  $20 \pm 1$ , Outdoor temperature =  $7 \pm 1$  Manually when entering diagnostics with the following settings: Mode = Cool, Set point = 16 Mode = Heat, Set point = 30 System can enter Test mode in two ways:

Automatically when the following conditions exists for 30 minutes continuously: Mode = Cool, Set point = 16, Room temperature =  $27 \pm 1$ , Outdoor temperature =  $35 \pm 1$  Or

Mode = Heat, Set point = 30, Room temperature =  $20 \pm 1$ , Outdoor temperature =  $7 \pm 1$  Manually when entering diagnostics with the following settings: Mode = Cool, Set point = 16 | Mode = Heat, Set point = 30



**13.12.2 Unit Operation in Test Mode**

In test mode, the unit will operate in fixed settings according to the indoor fan speed setting:

| Indoor FAN Speed Setting | Unit Setting             |
|--------------------------|--------------------------|
| Low                      | Minimum Capacity Setting |
| High                     | Nominal Capacity Setting |
| Auto                     | Maximum Capacity Setting |

**13.13 SW Parameters****13.13.1 Indoor Units SW Parameters**

Model Depended Parameters:

| Name         | HAD/WNG018 | HAD/WNG022 |
|--------------|------------|------------|
| ICTSTSpeed   | 25         | 25         |
| ICTVLSpeed   | 28         | 28         |
| ICTLSpeed    | 30         | 30         |
| ICTHSpeed    | 32         | 32         |
| ICTTSpeed    | 40         | 40         |
| MaxNLOADIF1C | 45         | 50         |
| MaxNLOADIF2C | 62         | 85         |
| MaxNLOADIF3C | 120        | 120        |
| MaxNLOADIF4C | 127        | 127        |
| MaxNLOADIF5C | 127        | 127        |
| NomLoadC     | 63         | 85         |
| NomLoadH     | 76         | 82         |
| IFVLOWC      | 700        | 800        |
| IFLOWC       | 900        | 1000       |
| IFMEDC       | 1050       | 1100       |
| IFHIGHC      | 1200       | 1250       |
| IFTURBOC     | 1250       | 1300       |
| IFVLOWH      | 700        | 800        |
| IFLOWH       | 900        | 950        |
| IFMEDH       | 1100       | 1150       |
| IFHIGHH      | 1250       | 1250       |
| IFTURBOH     | 1300       | 1300       |

### 13.13.2 Outdoor Units SW Parameters

| Name            | GC 18 | GC 21 |
|-----------------|-------|-------|
| MinFreqC        | 20    | 20    |
| MaxFreqC        | 85    | 95    |
| MinFreqH        | 20    | 26    |
| MaxFreqH        | 95    | 94    |
| Step1 Freq      | 60    | 60    |
| Step2Freq       | 70    | 70    |
| Step3Freq       | 90    | 90    |
| MaxFreqAsOATC   | 64    | 85    |
| MaxFreqAsOAT1 H | 85    | 80    |
| MaxFreqAsOAT2H  | 60    | 60    |
| CCROC1          | 10    | 11.4  |
| CCROC2          | 10.5  | 11.8  |
| CCROC3          | 10.8  | 12.2  |
| CCROC4          | 11.2  | 12.6  |
| OFVL            | 20    | 20    |
| OFLOWC          | 60    | 55    |
| OFMEDC          | 76    | 70    |
| OFMAXC          | 92    | 79    |
| OFLOWH          | 60    | 55    |
| OFMEDH          | 83    | 70    |
| OFMAXH          | 100   | 79    |

## 14. TROUBLESHOOTING

### Troubleshooting for GC 18/GC 21 DCI

**WARNING!!!**

When Power Up – the whole outdoor unit controller, including the wiring, is under HIGH VOLTAGE!!!

Never open the Outdoor unit before turning off the Power!!!

When turned off, the system is still charged (400V)!!!

It takes about 3 Min. to discharge the system.

Touching the controller before discharging may cause an electrical shock!!!

#### 14.1 Single Split System failures and Corrective Actions

| No | Symptom   | Probable Cause                                     | Corrective Action   |
|----|---|--|---|
| 1  | Power supply indicator (Red LED) does not light up.   | No power supply                                    | Check power supply. If power supply is OK, check display and display wiring. if OK, replace controller.   |
| 2  | Unit does not respond to remote control message   | Remote control message not reached the indoor unit | Check remote control batteries, if batteries are OK, check display and display wiring, if OK, replace display PCB.<br>If still not OK replace controller.   |
| 3  | Unit responds to remote control message but Operate indicator (Green LED) does not light up       | Problem with display PCB                           | Replace display PCB.<br>If still not OK replace controller.   |
| 4  | Indoor fan does not start (louvers are opened and Green LED does light up)                        | Unit in heat mode and coil is still not warm.      | Change to cool mode and check.  |
|    |   | Problem with PCB or capacitor                      | Change to high speed and Check power supply to motor is higher than 130VAC (for triack controlled motor) or higher than 220VAC for fixed speed motors, if OK replace capacitor, if not OK replace controller. |
| 5  | Indoor fan works when unit is OFF, and indoor fan speed is not changed by remote control command. | PCB problem  | Replace controller  |
| 6  | Compressor does not start   | Electronics control problem or protection          | Perform diagnostics and follow the actions described.   |
| 7  | Compressor stops during operation and Green LED remains on  | Electronic control or power supply problem         | Perform diagnostics and follow the actions described.   |
| 8  | Compressor is on but outdoor fan does not work  | Problem with outdoor electronics or outdoor fan    | Check outdoor fan motor according to the procedure below, if not OK replace controller.   |

| No | Symptom   | Probable Cause                                  | Corrective Action   |
|----|---|---|---|
| 9  | Unit works in wrong mode (cool instead of heat or heat instead of cool)         | Electronics or power connection to RV           | Check RV power connections, if OK, check RV operation with direct 230VAC power supply, if OK, replace outdoor controller. |
| 10 | All components are operating properly but no cooling or no heating              | Refrigerant leak                                | Check refrigeration system.   |
| 11 | Compressor is over heated and unit does not generate capacity                   | EEV problem                                     | Check EEV.  |
| 12 | Units goes into protections and compressor is stopped with no clear reason      | Control problem or refrigeration system problem | Perform diagnostics , and follow the actions described.   |
| 13 | Compressor motor is generating noise and no suction occurs                      | Phase order to compressor is wrong              | Check compressor phase order.   |
| 14 | Water leakage from indoor unit  | Indoor unit drainage tube is blocked            | Check and open drainage tube.   |
| 15 | Freezing of outdoor unit in heat mode and outdoor unit base is blocked with ice |   | Connect base heater.  |
| 16 | Unit operates with wrong fan speeds or wrong frequency                          | Wrong jumper settings                           | Perform diagnostics, and check if units is operating by EEPROM parameters.  |

## 14.2 Checking the refrigeration system

Checking system pressures and other thermodynamic measures should be done when system is in Test Mode (in Test mode, system operates in fixed settings). The performance curves given in this manual are given for unit performance in test mode when high indoor fan speed is selected.

Entering test mode:

Set unit to Cool/16 degrees/High indoor fan speed, or Heat/30 degrees/High indoor fan speed, and enter diagnostics.

### 14.3 Judgment by Indoor/Outdoor Unit Diagnostics

Enter diagnostics mode - press for five seconds Mode button in any operation mode. Acknowledgment is by 3 short beeps and lights of COOL and HEAT LED's. Then, every short pressing of Mode button will scroll between Indoor and Outdoor unit diagnostic modes by the acknowledgment of 3 short beeps and lighting of COOL and HEAT LED's.

During the Outdoor unit diagnostics all four Indoor LED's (STBY, Operate, Filter and Timer) are blinking. When Indoor diagnostics is displayed, all four LED's (STBY, Operate, Filter and Timer) are ON.

When system enters diagnostics mode, only one fault code is shown. Order of priority is from the lower to the higher number. Diagnostics is continuously ON as long as power is ON. The current system operation mode will not be changed.

If no fault occurred in the system, no fault code will be displayed during normal operation mode. The last fault code will be displayed even if the system has recovered from that fault. The last fault will be deleted from the EEPROM after the system has exit diagnostics mode.

In diagnostics mode, system fault / status will be indicated by blinking of Heat & Cool LEDs.

The coding method will be as follows:

Heat LED will blink 5 times in 5 seconds, and then will be shut off for the next 5 seconds. Cool LED will blink during the same 5 seconds according to the following Indoor / Outdoor unit tables:

Note: 0 – OFF, 1-ON

#### 14.3.1 Indoor Unit Diagnostics

| No  | Problem                   | 5 | 4 | 3 | 2 | 1 |
|-----|---------------------------|---|---|---|---|---|
| 1   | ICT is disconnected       | 0 | 0 | 0 | 0 | 1 |
| 2   | ICT is shorted            | 0 | 0 | 0 | 1 | 0 |
| 3   | RAT is disconnected       | 0 | 0 | 0 | 1 | 1 |
| 4   | RAT is shorted            | 0 | 0 | 1 | 0 | 0 |
| 5   | Reserved                  | 0 | 0 | 1 | 0 | 1 |
| 7   | Undefined IDU Family/mode | 0 | 0 | 1 | 1 | 1 |
| 8   | No Communication          | 0 | 1 | 0 | 0 | 0 |
| 9   | No Encoder                | 0 | 1 | 0 | 0 | 1 |
| 10  | Reserved                  | 0 | 1 | 0 | 1 | 0 |
| 11  | Outdoor Unit Fault        | 0 | 1 | 0 | 1 | 1 |
| ... | Reserved                  |   |   |   |   |   |
| 17  | Defrost protection        | 1 | 0 | 0 | 0 | 1 |
| 18  | Deicing Protection        | 1 | 0 | 0 | 1 | 0 |
| 19  | Outdoor Unit Protection   | 1 | 0 | 0 | 1 | 1 |
| 20  | Indoor Coil HP Protection | 1 | 0 | 1 | 0 | 0 |
| 21  | Overflow Protection       | 1 | 0 | 1 | 0 | 1 |
| 22  | Reserved                  |   |   |   |   |   |
| 24  | EEPROM Not Updated        | 1 | 1 | 0 | 0 | 0 |
| 25  | Bad EEPROM                | 1 | 1 | 0 | 0 | 1 |
| 26  | Bad Communication         | 1 | 1 | 0 | 1 | 0 |
| 27  | Using EEPROM data         | 1 | 1 | 0 | 1 | 1 |
| 28  | Model A                   | 1 | 1 | 1 | 0 | 0 |
| 29  | Model B                   | 1 | 1 | 1 | 0 | 1 |
| 30  | Model C                   | 1 | 1 | 1 | 1 | 0 |
| 31  | Model D                   | 1 | 1 | 1 | 1 | 1 |

**14.3.2 Indoor Unit Diagnostics and Corrective Actions**

| No. | Fault                        | Probable Cause   | Corrective Action   |
|-----|------------------------------|--|---|
| 1   | Sensor failures of all types |  | Check sensor connections or replace sensor  |
| 2   | Communication mismatch       | Indoor and Outdoor controllers are with different versions | Replace Indoor controller   |
| 3   | No Communication             | Communication or grounding wiring is not good.             | Check Indoor to Outdoor wiring and grounding  |
| 4   | No Encoder                   | Indoor electronics or motor                                | Check motor wiring, if ok, replace motor, if still not ok, replace Indoor controller. |
| 5   | Outdoor Unit Fault           | Outdoor controller problem                                 | Switch to Outdoor diagnostics.  |
| 6   | EEPROM Not Updated           | System is using ROM parameters and not EEPROM parameters   | No action, unless special parameters are required for unit operation.                 |
| 7   | Bad EEPROM                   |  | No action, unless special parameters are required for unit operation.                 |
| 8   | Bad Communication            | Communication quality is low reliability                   | Check Indoor to Outdoor wiring and grounding  |
| 9   | Using EEPROM data            | No problem. System is using EEPRRRROM parameters           |   |

### 14.3.3 Outdoor Unit Diagnositis

| No | Problem                                      | 5 | 4 | 3 | 2 | 1 |
|----|--|---|---|---|---|---|
| 1  | OCT is disconnected                          | 0 | 0 | 0 | 0 | 1 |
| 2  | OCT is shorted                               | 0 | 0 | 0 | 1 | 0 |
| 3  | CTT is disconnected                          | 0 | 0 | 0 | 1 | 1 |
| 4  | CTT is shorted                               | 0 | 0 | 1 | 0 | 0 |
| 5  | HST is disconnected (when enabled)           | 0 | 0 | 1 | 0 | 1 |
| 6  | HST is shorted (when enabled)                | 0 | 0 | 1 | 1 | 0 |
| 7  | OAT is disconnected (when enabled)           | 0 | 0 | 1 | 1 | 1 |
| 8  | OAT is shorted (when enabled)                | 0 | 1 | 0 | 0 | 0 |
| 9  | TSUC is disconnected (when enabled)          | 0 | 1 | 0 | 0 | 1 |
| 10 | TSUC is shorted (when enabled)               | 0 | 1 | 0 | 1 | 0 |
| 11 | IPM Fault                                    | 0 | 1 | 0 | 1 | 1 |
| 12 | Bad EEPROM                                   | 0 | 1 | 1 | 0 | 0 |
| 13 | DC under voltage                             | 0 | 1 | 1 | 0 | 1 |
| 14 | DC over voltage                              | 0 | 1 | 1 | 1 | 0 |
| 15 | AC under voltage                             | 0 | 1 | 1 | 1 | 1 |
| 16 | Indoor / Outdoor unit Communication mismatch | 1 | 0 | 0 | 0 | 0 |
| 17 | No Communication                             | 1 | 0 | 0 | 0 | 1 |
| 18 | Reserved                                     | 1 | 0 | 0 | 1 | 0 |
| 20 | Heat sink Over Heating                       | 1 | 0 | 1 | 0 | 0 |
| 21 | Deicing                                      | 1 | 0 | 1 | 0 | 1 |
| 22 | Compressor Over Heating                      | 1 | 0 | 1 | 1 | 0 |
| 23 | Compressor Over Current                      | 1 | 0 | 1 | 1 | 1 |
| 24 | No OFAN Feedback                             | 1 | 1 | 0 | 0 | 0 |
| 25 | OFAN locked                                  | 1 | 1 | 0 | 0 | 1 |
| 26 | Compressor Lock                              | 1 | 1 | 0 | 1 | 0 |
| 27 | Bad Communication                            | 1 | 1 | 0 | 1 | 1 |

### 14.3.4 Outdoor Unit Diagnostics and Corrective Actions

| No | Fault  | Probable Cause   | Corrective Action   |
|----|--|--|---|
| 1  | Sensors failures of all types                |  | Check sensors connections or replace sensors.                         |
| 2  | IPM Fault                                    | Electronics HW problem                                     | Check all wiring and jumper settings, if OK, replace electronics.     |
| 3  | Bad EEPROM                                   |  | No action, unless special parameters are required for unit operation. |
| 4  | DC under/over Voltage                        | Electronics HW problem                                     | Check outdoor unit power supply voltage                               |
| 5  | AC under Voltage                             |  | Check outdoor unit power supply voltage                               |
| 6  | Indoor / Outdoor unit Communication mismatch | Indoor and Outdoor controllers are with different versions | Replace Indoor controller   |
| 7  | No Communication                             | Communication or grounding wiring is not good.             | Check Indoor to Outdoor wiring and grounding                          |
| 8  | Compressor Lock                              |  | Switch unit to STBY and restart                                       |
| 9  | Bad Communication                            | Communication quality is low reliability                   | Check Indoor to Outdoor wiring and grounding                          |

## 14.4 Judgment by MegaTool

MegaTool is a special tool to monitor the system states.

Using MegaTool requires:

- A computer with RS232C port.
- A connection wire for MegaTool.
- A special MegaTool software.

Use MegaTool according to following procedure:

- Setup MegaTool software: copy the software to the computer.
- Connect RS232C port in computer with MegaTool port in Indoor/Outdoor unit controller by the connection wire.
- Run the software and choose the COM port, you can monitor the A/C system state

In monitor tab

## 14.5 Simple procedures for checking the Main Parts

### 14.5.1 Checking Mains Voltage.

Confirm that the Mains voltage is between 198 and 264 VAC. If Mains voltage is out of this range, abnormal operation of the system is expected. If in range check the Power (Circuit) Breaker and look for broken or loosed cable lugs or wiring mistake(s).

### 14.5.2 Checking Power Input.

If Indoor unit power LED is unlighted, power down the system and check the fuse of the Indoor unit. If the fuse is OK replace the Indoor unit controller. If the fuse has blown, replace the fuse and power up again.

Checking Power Input procedure for the Outdoor unit is the same as with the Indoor unit.

### 14.5.3 Checking the Outdoor Fan Motor.

Enter Test Mode (where the OFAN speed is high)

Check the voltage between lead wires according to the normal value as following:

- Between red wire and black wire: 310VDC +/- 20V
- Between orange wire and black wire: 15VDC +/- 1V
- Between yellow wire and black wire: 2-6VDC

### 14.5.4 Checking the Compressor.

The compressor is brushless permanence magnetic DC motor. Three coil resistance is same. Check the resistance between three poles. The normal value should be below 0.5 ohm (TBD).

### 14.5.5 Checking the Reverse Valve (RV).

Running in heating mode, check the voltage between two pins of reverse valve connector, normal voltage is 220VAC.

### 14.5.6 Checking the electrical expansion valve (EEV).

The EEV has two parts, drive part and valve. The drive part is a step motor; it is ringed on the valve. Check the drive voltage (12VDC). When Outdoor unit is power on, EEV shall run and have click and vibration.



## **14.6      Precaution, Advise and Notice Items**

### **14.6.1      High voltage in Outdoor unit controller.**

Whole controller, including the wires that are connected to the Outdoor unit controller may have the potential hazard voltage when power is on. Touching the Outdoor unit controller may cause an electrical shock.

Advise: Don't touch the naked lead wire and don't insert finger, conductor or anything else into the controller when power is on.

### **14.6.2      Charged Capacitors**

Three large-capacity electrolytic capacitors are used in the Outdoor unit controller. Therefore, charging voltage (380VDC) remains after power down. Discharging takes about four minutes after power is off. Touching the Outdoor unit controller before discharging may cause an electrical shock.

### **14.6.3      Additional advises**

- When disassemble the controller or the front panel, turn off the power supply.
- When connecting or disconnecting the connectors on the PCB, hold the whole housing, don't pull the wire.
- There are sharp fringes and sting on shell. Use gloves when disassemble the A/C units.

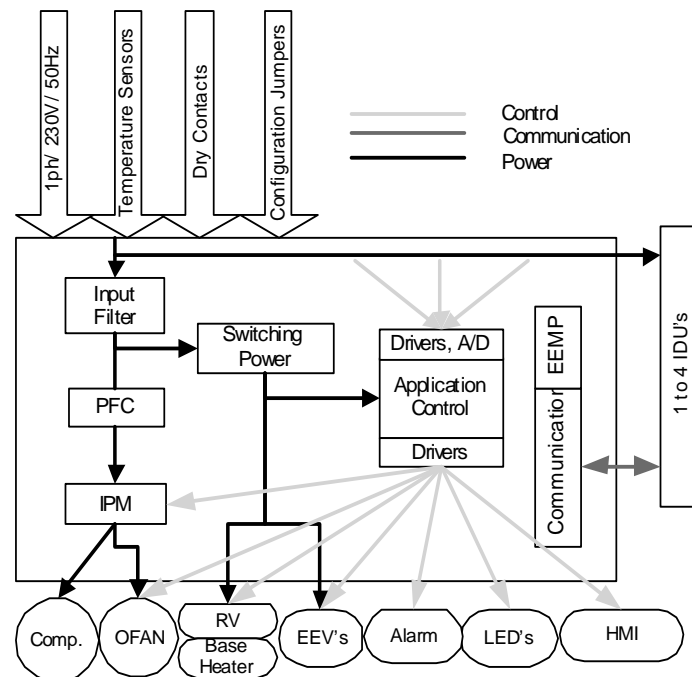
## 15. CONTROL SYSTEM [HAD024]

### 15.1 Abbreviations

| Abbreviation   | Definition                           |
|----------------|--------------------------------------|
| <b>A/C</b>     | Air Condition                        |
| <b>BMS</b>     | Building Management System           |
| <b>PWR</b>     | System Power                         |
| <b>CTT</b>     | Compressor Top Temperature sensor    |
| <b>DCI</b>     | DC Inverter                          |
| <b>EEV</b>     | Electronic Expansion Valve           |
| <b>HE</b>      | Heating Element                      |
| <b>HMI</b>     | Human Machine Interface              |
| <b>HST</b>     | Heat Sink Temperature sensor         |
| <b>Hz</b>      | Hertz (1/sec) - electrical frequency |
| <b>ICT</b>     | Indoor Coil Temperature (RT2) sensor |
| <b>IDU</b>     | Indoor Unit                          |
| <b>MCU</b>     | Micro Controller Unit                |
| <b>OAT</b>     | Outdoor Air Temperature sensor       |
| <b>OCT</b>     | ODU Coil Temperature sensor          |
| <b>ODU</b>     | Outdoor Unit                         |
| <b>OFAN</b>    | Outdoor Fan                          |
| <b>PFC</b>     | Power Factor Corrector               |
| <b>RAC</b>     | Residential A/C                      |
| <b>RC</b>      | Reverse Cycle (Heat Pump)            |
| <b>RGT</b>     | Return Gas Temperature sensor        |
| <b>RPS</b>     | Rounds per second (mechanical speed) |
| <b>RV</b>      | Reverse Valve                        |
| <b>SB,STBY</b> | Stand By                             |
| <b>OMT</b>     | Outdoor Middle Temperature           |
| <b>S/W</b>     | Software                             |
| <b>TBD</b>     | To Be Defined                        |
| <b>TMR</b>     | Timer                                |

## 15.2 Product Overview

### 15.2.1 Block Diagram



#### 15.2.2 Compressor

DC brush less and sensor less 2.5/3 horsepower motor inverter driven compressor.

#### 15.2.3 Outdoor Fan

DC brush less motor.

#### 15.2.4 RV

Reverse Valve set the direction of refrigerant flow in the system, thus setting the operation mode for cooling or heating.

When the solenoid is powered, system will work in heat mode.

#### 15.2.5 EEV's

Expansion valve operated by step motor which controls the size of the orifice.

#### 15.2.6 HMI (Optional for single)

Three "7-Segments" + four Push buttons

#### 15.2.7 Dry Contacts

Dry contacts are used to interface the system with an external building management system (BMS).

- **Night** input. Switches the system to night mode when closed.

During night mode, the outdoor unit speed will be reduced in order to reduce the system noise level.

- **SB** input. System will be turned to Stand-by when the contact is closed.
- **Power Shedding** input. Limits the maximum power consumption when closed.
- **Forced Mode** input. Used to force the operation mode of the system
- **Alarm** output indicates a failure at the system.

Alarm output will be activated when there in the following ODU Faults/Protections 1 to 6, 8 to 22, 24, 25, 27 and 28.

Alarm output will be OFF when the Fault/Protection is cleared.

### 15.2.8 Temperature Sensors

- ◆ **CTT** - Compressor Top Temperature
- ◆ **OAT** - Outdoor Air Temperature
- ◆ **OMT** - Outdoor Middle Temperature
- ◆ **OCT** - Outdoor Coil (heat exchanger) Temperature
- ◆ **HST** - Heat Sink Temperature

### 15.2.9 Base Heater

Heating element designed to melt any ice that is accumulated on the outdoor unit base during low heating operation.

## 15.3 General Operating Rules

### 15.3.1 Initialization

Initialization process is the first operation done each time power is up. The targets of the initialization are:

- Addressing of IDU's
- Identification of connected IDU's
- IDU Matching Check
- EEV's homing (reset position)
- Restoring Parameters from EEPROM/Jumpers/Dipswitches

#### 15.3.1.1 IDU's Initialization Faults Definition and System Response

|   | Fault                               | Activity  | Fault Display                | System response          |
|---|-------------------------------------|---|------------------------------|--------------------------|
| ⌘ | Missing IDU                         | Update new IDU status stored at the EEPROM.                               | System configuration Changed |                          |
| ⌘ | Change in IDU Family/Capacity Group | Fault will be stored in EEPROM as an inactive failure of the specific IDU | System configuration Changed |                          |
| ⌘ | IDU Code Exceed Limit               | Fault will be stored in EEPROM for the specific IDU                       | System Configuration Problem | System will switch to SB |
| ⌘ | Total IDU Code Exceed Limit         | ODU fault will be stored in EEPROM  | System Configuration Problem | System will switch to SB |

#### 15.3.1.2 WNG72/80 Definition

| Indoor Model | Family | Model | IDU Code |
|--------------|--------|-------|----------|
| WNG72        | WNG 18 | C     | 3        |
| WNG80        | WNG 30 | A     | 3        |

The models are named by their family and capacity. For example WNG 9 means a wall mounted units with a nominal cooling capacity of 9000 Btu/hr (which is equivalent to 2.5 kW). The nominal capacity of the indoor unit sets it's capacity code

### 15.3.2 Communication with Indoor Units

#### 15.3.2.1 Communication Failures Definition

Two types of communication failures are diagnosed. The communication failures are checked separately for IDU channel.

##### 15.3.2.1.1 'Bad Communication' fault

The system keeps a balance of a good/bad communication packet ratio for communication channel. When the ratio getting high, system enters 'Bad Communication' fault.

##### 15.3.2.1.2 'No Communication' fault

If no legal transmission or no message received for 30 seconds, system enters 'No Communication' fault.

When in 'No Communication' fault, the system will act as following:

- ♣ If there is no communication, the following will be performed:
  1. The unit changes to SB.
  2. The system will scan all the communication.
  3. Each channel that is identified as 'no communication' channel will be referred as STBY unit.
  4. The unit resumes its normal operation with only the operative channels.

### 15.3.3 Temperature Measurements

#### 15.3.3.1 Thermistor failures definition

| Thermistor | Thermistor is Disconnected | Thermistor is Shorted |
|------------|----------------------------|-----------------------|
| OCT        | Temp < -40 °C              | Temp > 75 °C          |
| OAT        | Temp < -40 °C              | Temp > 75 °C          |
| CTT        | Temp < -30 °C              | Temp > 130 °C         |
| OMT        | Temp < -40 °C              | Temp > 75 °C          |
| HST        | Temp < -30 °C              | Temp > 130 °C         |

#### 15.3.3.2 System responses for different thermistor failure

| Thermistor | Default value      | System Reaction                            |
|------------|--------------------|--|
| OCT        | 6°C                |  |
| OAT        | Cool 35°C Heat 7°C |  |
| CTT        | 43°C               | Forced compressor to OFF after 20 minutes. |
| OMT        | 43°C               |  |
| HST        | 43°C               |  |
| ICT        | 43°C               |  |

### 15.3.4 Flash Memory Programming

In order to upgrade the ODU software the auxiliary port will be used. A special application should be run on a PC to transmit the new firmware.

## 15.4 Indoor Unit Control

### 15.4.1 Indoor Fan Control

10 Indoor fan speeds are determined for each model. 5 speeds for each mode cool/dry/fan or heat. When user sets the indoor fan speed to a fixed speed (Low/ Medium/ High), unit will operate constantly at set speed.  
When Auto Fan is selected, indoor unit controller can operate in all speeds. The actual speed is set according to the cool/heat load.

### 15.4.1.1 Turbo Speed

The Turbo speed is activated during the first 30 minutes of unit operation when auto fan speed is selected and under the following conditions:

Difference between set point and actual room temperature is higher than 3 degrees. Room temperature is higher than 22°C for cooling or less than 25°C for heating.

### 15.4.2 Cool Mode

NLOAD is calculated according to the difference between actual room temperature and user set point temperature by PI control.

In high/ medium/ low indoor fan user setting, unit will operate fan in selected speed.

In AutoFan user setting, fan speed will be adjusted automatically according to the calculated NLOAD.

### 15.4.3 Heat Mode

NLOAD is calculated according to the difference between actual room temperature and user set point temperature by PI control.

In high/ medium/ low indoor fan user setting, unit will operate fan in selected speed.

In AutoFan user setting, fan speed will be adjusted automatically according to the calculated NLOAD.

#### 15.4.3.1 Temperature Compensation

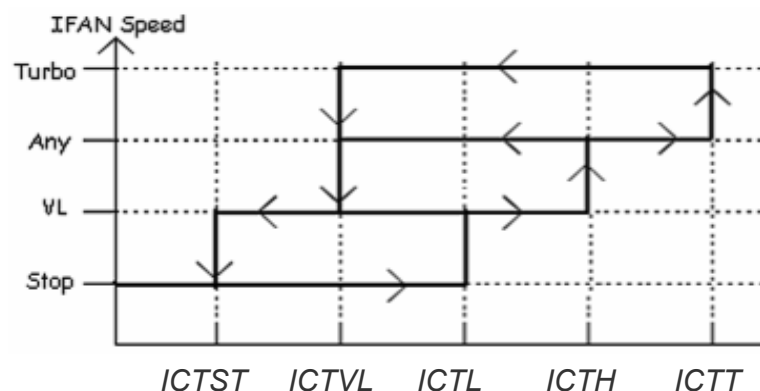
In wall mounted, ducted, and cassette models, 3 degrees are reduced from room temperature reading (except when in I-Feel mode), to compensate for temperature difference between high and low areas in the heated room, and for coil heat radiation on room thermistor.

The temperature compensation can be enabled/disabled by shortening of J2 on the indoor unit controller.

| Model         | J2 Shorted            | J2 Opened             |
|---------------|-----------------------|-----------------------|
| Wall mounted  | Compensation Disabled | Compensation Enabled  |
| Cassette      | Compensation Enabled  | Compensation Disabled |
| Ducted        | Compensation Enabled  | Compensation Disabled |
| Floor/Ceiling | Compensation Disabled | Compensation Enabled  |

#### 15.4.3.2 Indoor Unit Control in Heat Mode

Indoor fan speed depends on the indoor coil temperature



#### 15.4.4 Auto Cool/Heat Mode

When in auto cool heat mode unit will automatically select between cool and heat mode according to the difference between actual room temperature and user set point temperature ( $\Delta T$ ).

Unit will switch from cool to heat when compressor is off for 3 minutes, and  $\Delta T < -3$ .

Unit will switch from heat to cool when compressor is off for 5 minutes, and  $\Delta T < -3$ .

#### 15.4.5 Dry Mode

As long as room temperature is higher than the set point, indoor fan will work in low speed and compressor will work between 0 and *MaxNLOADIF1C* Hz.

When the room temperature is lower than the set point, compressor will be switched OFF and indoor fan will cycle 3 minutes OFF, 1 minute ON.

#### 15.4.6 Indoor Units Operation when Indoor Unit Mode is Different than Outdoor Unit Mode

- Open louvers according to user selection.
- Indoor fan is forced to OFF.

#### 15.4.7 Heating Element Control

Heating element can be lit on if  $LOAD > 0.8 * \text{MaximumNLOAD}$  AND Indoor Coil temperature  $< 45^{\circ}\text{C}$ .

The heating element will be off when  $LOAD < 0.5 * \text{MaximumNLOAD}$  OR if Indoor Coil temperature  $> 50^{\circ}\text{C}$ .

#### 15.4.8 Ionizer Control

WNG Family - Ionizer is on when unit is on AND indoor fan is on AND Ioniser power switch (on Ioniser) is on.

#### 15.4.9 Indoor Unit Dry Contact

Indoor unit Dry contact has two alternative functions that are selected by J8.

| Status     | Function                     | Contact = Open | Contact = Short |
|------------|------------------------------|----------------|-----------------|
| J8 = Open  | Presence Detector Connection | No Limit       | Forced to STBY  |
| J8 = Short | Power Shedding Function      | No Limit       | Limit NLOAD     |

#### 15.4.10 Operating the Unit from the Mode Button

Forced operation allows to start, stop and operate in Cooling or Heating, in pre-set temperature according to the following table:

| Forced operation Mode | Pre-set Temperature |
|-----------------------|---------------------|
| Cooling               | 20°C                |
| Heating               | 28°C                |

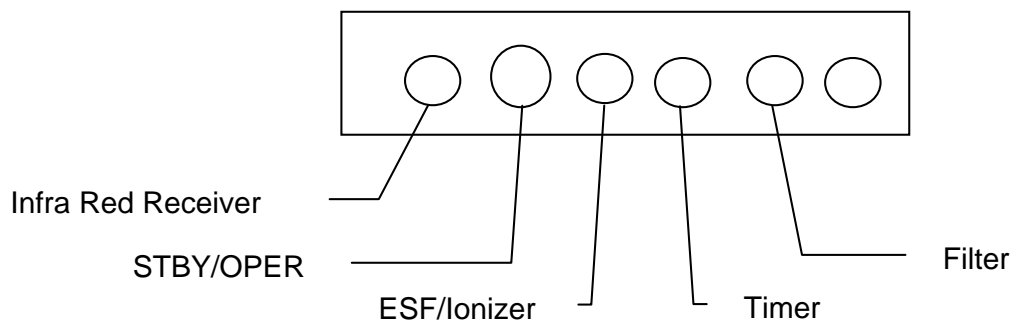
## 15.4.11 On Unit Controls and Indicators

### 15.4.11.1 All models Expect for Floor/Ceiling model

|                            |   |
|----------------------------|---|
| <b>STAND BY INDICATOR</b>  | <ol style="list-style-type: none"> <li>1. Lights up when the Air Conditioner is connected to power and the mode is STBY.</li> <li>2. Blinks for 3 times at 600 msec each cycle, when the system is switched to Heat Mode by using the Mode/Reset Switch on the unit (the operation indicator will be off during this blinking time).</li> </ol>   |
| <b>OPERATION INDICATOR</b> | <ol style="list-style-type: none"> <li>1. Lights up during operation mode (except for item in STBY indicator).</li> <li>2. Blinks for 600 msec. cycle, to announce that a R/C infrared signal has been received and stored.</li> <li>3. Blinks continuously during protections (according to the relevant spec section).</li> <li>4. Blinks for 3 times at 600 msec each cycle when the system is switched to Cool Mode by using the Mode/Reset Switch on the unit</li> </ol>   |
| <b>TIMER INDICATOR</b>     | Lights up during Timer and Sleep operation.   |
| <b>FILTER INDICATOR</b>    | Lights up when Air Filter needs to be cleaned.  |
| <b>Mode/Reset Button</b>   | <p>As long as the filter Led is off, the Mode/Reset button functions as Mode switch. Once filter Led is on, the Mode/Reset button functions as Reset switch. Mode Function:<br/>           Every short pressing , the next operation mode is selected, in this order: SB — Cool Mode — Heat Mode — SB — ... In long pressing system enters diagnostic mode (refer to diagnostic mode Sect.)<br/>           Reset Function: For short pressing:<br/>           When Filter LED is on, it turns off the filter indicator.</p> |

### 15.4.11.2 Indoor Unit Controller and Indicators

The following is schematic drawing for the display:



## Run Mode

Run mode is the default operation mode of the system. This is the standard operation mode that is active in field application (at customer site).

System can go from run mode to other operation modes through keyboard or serial ports



### 15.4.12 Mode Setting

Mode defines the ODU operation mode. There are three possible operation modes:

1. STBY - standby mode
2. COOL - the unit operating at cooling cycle
3. HEAT - the unit operating at heat pump cycle

The ODU define the system operation mode according to three methods set by the display key board:

1. First request priority  
The first IDU which requests different mode than STBY mode will set the new operation mode. The mode will change once all the units exit the current operation mode.
2. Priority unit  
If an IDU is defined as a priority unit, the operational mode will be defined according to that unit request, unless the unit is at STBY mode.  
In case priority unit is SB the mode will be set according to first request priority.
3. Forced operation mode  
If forced mode is enabled then the ODU mode will be forced according to the Forced mode input:  
Open → COOL  
Short → HEAT  
The ODU will go to SB if all the IDU are at SB or at different modes.
4. SB Input  
The ODU will change mode between COOL/HEAT and Idle according to the STBY dry contact input as follows:

| STBY input    | ODU mode                        |
|---------------|---------------------------------|
| Short         | SB                              |
| Short -> Open | last mode                       |
| Open          | according normal mode selection |

### 15.4.13 Compressor Speed Control

#### 15.4.13.1 Compressor Min On/Off time

Compressor minimum OFF time is MinOFFTime minutes except during Deicing protection. Compressor minimum ON time is MinOnTime minutes, minimum ON time is ignored during protections, and when unit is turned to STBY.

#### 15.4.13.2 Compressor Speed calculation

During normal operation (excluding protections), the compressor speed is limited by the minimum speeds:

| Min Speed Cool | Max Speed Cool | Min Speed Heat | Max Speed Heat |
|----------------|----------------|----------------|----------------|
| 15             | 75             | 15             | 95             |

#### 15.4.13.3 Indoor Units NLOAD calculation

The NLOAD setting is done by the indoor unit controller, based on a PI control scheme. The actual NLOAD to be sent to the outdoor unit controller is based on the preliminary LOAD calculation, the indoor fan speed, and the power shedding function.

NLOAD limits as a function of indoor fan speed:

| Indoor Fan Speed | Maximum NLOAD Cooling | Maximum NLOAD Heating |
|------------------|-----------------------|-----------------------|
| Low              | Max NLOADIF1C         | 127                   |
| Medium           | Max NLOADIF2C         | 127                   |
| High             | Max NLOADIF3C         | 127                   |
| Turbo            | Max NLOADIF4C         | 127                   |
| Auto             | Max NLOADIF5C         | 127                   |

NLOAD limits as a function of power shedding:

| Mode | Power Shedding OFF | Power Shedding ON |
|------|--------------------|-------------------|
| Cool | No limit           | Nominal Cooling   |
| Heat | No limit           | Nominal Heating   |

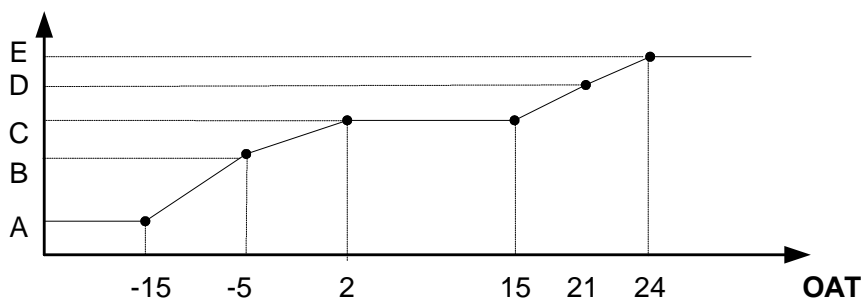
#### 15.4.13.4 Outdoor Unit NLOAD calculation

ODU NLOAD is the weighted average of IDU NLOAD

$$ODU\ NLOAD = \frac{\sum IDU\ NLOAD \cdot Code}{ODUCode}$$

ODU codeH is defined as following:

ODU Code



| Point | Single WNG72 | Single WNG80 |   |   |   |
|-------|--------------|--------------|---|---|---|
| A     | 3            | 3            | - | - | - |
| B     | 3            | 3            | - | - | - |
| C     | 3.8          | 3.8          | - | - | - |
| D     | 3.8          | 3.8          | - | - | - |
| E     | 3.8          | 3.8          | - | - | - |

The code for heat mode is related also to outdoor temperature and so in low heating conditions the compressor speed will be higher.

Compressor speed will be set between the minimum speed and the max speed according to the ODU NLOAD

ODU CodeC is defined as following (EEPROM values):

| Unit type        | ODU codeC |
|------------------|-----------|
|                  | Cool      |
| Single (Default) | 3         |

#### 15.4.13.5 Speed Step Limitations

##### 15.5.13.5.1 Step 1 and step 2

The compressor speed cannot go below Step1RPS or above Step2RPS during 3 continuous minutes once after the compressor starts up when the ODU unit changes from STBY.

**15.4.13.5.2 Step 3 limit**

The speed cannot go higher than Step3RPS unless it was operating for more than 1 continuous minute between Step3RPS - 5 and Step3RPS.

**15.4.14 EEV Control****15.4.15.1 Operation Range**

The EEV operation range is defined according to the operation mode as following

| ODU Mode | Normal operation | IDU inactive | Compressor off |
|----------|------------------|--------------|----------------|
| SB       | 200              |              | 200            |
| COOL     | 80 to 350        | 0            |                |
| HEAT     | 70 to 400        | 60 to 140    |                |

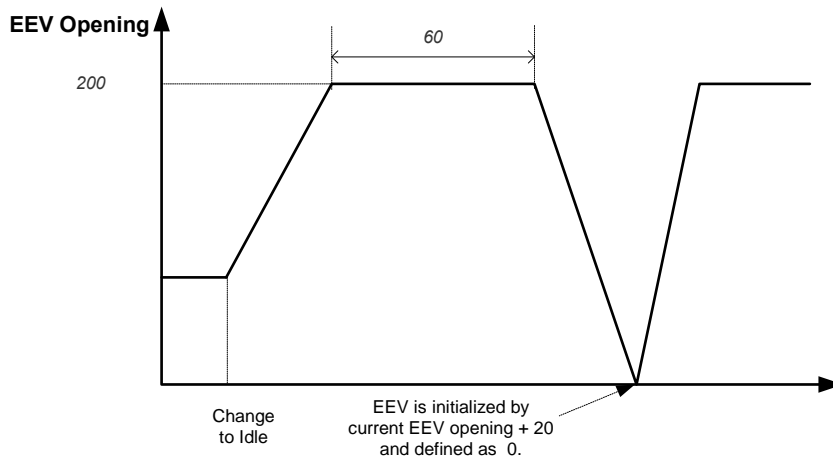
**15.4.15.2 Reaching target value rules**

For all cases except at EEV initialization procedure, each EEV can move no more than 20 steps at a time.

**15.4.15.3 EEV Operation when ODU changes to SB Mode**

When the ODU mode is changed to SB, the following is performed immediately

- EEV is set to 200.
- They remain in this position for 60 Sec.
- Then, performs reset (*homing*) procedure.

**15.4.15.4 EEV Opening Determination**

The target EEV value is the sum of open loop value (OL) and a result of the accumulative correction values (CV).

$$EEV = EEV_{OL} + \sum EEV_{CV}$$

**15.4.15.5 EEV initial value determination**

The EEV initial value (open loop) is determined according to the mode, and the capacity code of the unit.

| Basic EEV Open loop |              |   |   |   |
|---------------------|--------------|---|---|---|
| Mode                | WNG72 and 80 |   |   |   |
|                     | 1            | 2 | 3 | 4 |
| COOL                | 220          | - | - | - |
| HEAT                | 210          | - | - | - |

#### 15.4.15.6 Balance time

During the first 6 minutes after SB the correction is not calculated. After that the correction value is updated every 30 seconds.

#### 15.4.15.7 EEV corrections

The corrections in cool mode will keep the compressor in the proper operation temperature and will balance between the indoor units by controlling CTT-OMT.

#### 15.4.15.8 Accumulative correction value storage

The accumulated EEV correction value will be stored in the memory. Default correction values after power up are zero.

### 15.4.15 Outdoor Fan Speed Control

#### 15.4.15.1 General Rules

- o OFAN operates between *OFMinRPM* to *OFMaxRPM*.
  - o Min time for speed change of OFAN *OFMinTimeReduce* (60 seconds).
- There are 4 defined speeds - High, Med, Low, and Very Low.  
The actual OFAN speeds in cool mode are defined according to the following table:

| Freq | Outdoor air temperature (OAT) |     |     |     |     |     |     |     |     |     |     |     |
|------|-------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|      | -10                           | -5  | 0   | 5   | 10  | 15  | 20  | 25  | 30  | 35  | 40  | 46  |
| 0    | 0                             | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
| 15   | 80                            | 100 | 120 | 130 | 220 | 340 | 460 | 580 | 600 | 730 | 730 | 730 |
| 25   | 130                           | 140 | 160 | 190 | 250 | 380 | 600 | 610 | 670 | 730 | 740 | 750 |
| 35   | 160                           | 180 | 210 | 250 | 330 | 470 | 730 | 730 | 730 | 730 | 780 | 800 |
| 45   | 205                           | 230 | 260 | 320 | 440 | 600 | 730 | 730 | 730 | 730 | 800 | 850 |
| 55   | 250                           | 280 | 310 | 390 | 550 | 730 | 730 | 730 | 730 | 730 | 800 | 850 |
| 65   | 275                           | 315 | 355 | 470 | 640 | 730 | 730 | 730 | 730 | 730 | 800 | 850 |
| 75   | 300                           | 350 | 400 | 550 | 730 | 730 | 730 | 730 | 730 | 730 | 800 | 850 |
| 85   | 325                           | 395 | 445 | 630 | 730 | 730 | 730 | 730 | 730 | 730 | 800 | 850 |
| 95   | 350                           | 440 | 490 | 710 | 730 | 730 | 730 | 730 | 730 | 730 | 800 | 850 |

The actual OFAN speeds in heat mode are defined according to the following table:

| Freq | Outdoor air temperature (OAT) |     |     |     |     |     |     |
|------|-------------------------------|-----|-----|-----|-----|-----|-----|
|      | -15                           | -7  | 0   | 7   | 14  | 21  | 24  |
| 0    | 0                             | 0   | 0   | 0   | 0   | 0   | 0   |
| 15   | 850                           | 850 | 750 | 750 | 500 | 350 | 300 |
| 25   | 850                           | 850 | 750 | 750 | 520 | 370 | 320 |
| 35   | 850                           | 850 | 750 | 750 | 540 | 390 | 340 |
| 45   | 850                           | 850 | 750 | 750 | 560 | 410 | 360 |
| 55   | 850                           | 850 | 750 | 750 | 580 | 430 | 380 |
| 65   | 850                           | 850 | 750 | 750 | 600 | 450 | 400 |
| 75   | 850                           | 850 | 750 | 750 | 620 | 470 | 420 |
| 85   | 850                           | 850 | 750 | 750 | 640 | 490 | 440 |
| 95   | 850                           | 850 | 750 | 750 | 650 | 500 | 450 |

The fan speed is also related to protections and OMT value.

#### 15.4.15.2 Behavior when there is a failure in OFAN

Whenever OFAN fault occurs the compressor will be stopped immediately, except during deicing protection, then the OFAN will be enabled to be started for maximum 5 times. This rule is enabled each time the ODU switches to heat/cool modes.

**15.4.15.3 Protection Behavior**

- When in total IDU protection level is different than normal, the OFAN will reduce *OFSpdReducePrnC* and *OFSpdReducePrnH* RPM for cool and heat respectively.
- In cool mode the OFAN will operate according to CTT or HST protection level:

| Protection level | Action  |
|------------------|---|
| SR, D1 or D2     | OFAN will add 100 RPM to the target speed   |
| Stop-Compressor  | continue to operate for maximum 2 minutes at it last speed or until normal level is achieved. |

**15.4.15.4 OFAN Force On condition**

If HST is higher than 70°C or defined as “HST bad”, OFAN will remain ON at the last operating speed for maximum 2 minutes after COMP is OFF.

**15.4.15.5 Night mode**

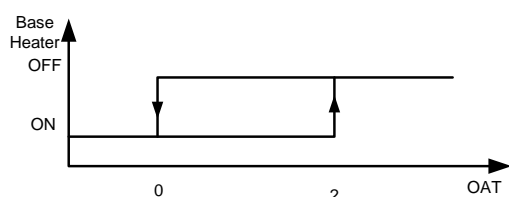
Upon receiving night mode, the OFAN will be limited to max *NightRPM* speed only in Cool. It will be back to its normal operation when receiving the mode is cleared.

**15.4.16 RV State Setting**

During heat mode (except during Deicing) RV is ON. During cool/SB mode RV is OFF. RV status will be changed only if COMP is OFF for 3 minutes or more.

**15.4.17 Base Heater Setting**

The base heater will be working only when RV is “ON” according to the following graph:



When OAT is faulty the base heater will be “ON” continuously in HEAT mode.

**15.4.18 Thermodynamic Protections****15.5.18.1 Protection level definition**

Five protection levels are defined:

**Normal** - No protection status is ON.

**Stop-Rise (SR)** - System is in protection, first level

**D1** - System is in protection, second level

**D2** - System is in protection third level

**Stop-Compressor (SC)** - System is in protection fourth level

**15.4.18.2 IDU Protection Level**

The ODU receives the protection levels from the IDU. The protection levels are weighted according to the following table:

| Protection Level | Weight |
|------------------|--------|
| Normal           | 0      |
| Stop-Rise        | 1      |
| D1               | 2      |
| D2               | 3      |
| Stop-Compressor  | 0      |

### 15.4.18.3 IDU Protections

#### 15.4.18.3.1 Indoor Cooil Defrost Protection

| ICT          | ICT Trend       |            |           |            |                 |
|--------------|-----------------|------------|-----------|------------|-----------------|
|              | Fast Increasing | Increasing | No change | Decreasing | Fast Decreasing |
| ICT < -2     | SC              | SC         | SC        | SC         | SC              |
| -2 < ICT < 0 | D1              | D1         | D2        | D2         | D2              |
| 0 < ICT < 2  | SR              | SR         | D1        | D2         | D2              |
| 2 < ICT < 4  | SR              | SR         | SR        | D1         | D2              |
| 4 < ICT < 6  | Norm            | Norm       | SR        | SR         | D1              |
| 6 < ICT < 8  | Norm            | Norm       | Norm      | SR         | SR              |
| 8 < ICT      | Normal          |            |           |            |                 |

#### 15.4.18.3.2 Indoor Coil over Heating Protection

| ICT           | ICT Trend       |            |           |            |                 |
|---------------|-----------------|------------|-----------|------------|-----------------|
|               | Fast Decreasing | Decreasing | No Change | Increasing | Fast Increasing |
| ICT > 55      | SC              | SC         | SC        | SC         | SC              |
| 53 < ICT < 55 | D1              | D1         | D2        | D2         | D2              |
| 49 < ICT < 53 | SR              | SR         | D1        | D2         | D2              |
| 47 < ICT < 49 | SR              | SR         | SR        | D1         | D2              |
| 45 < ICT < 47 | Norm            | Norm       | SR        | SR         | D1              |
| 43 < ICT < 45 | Norm            | Norm       | Norm      | SR         | SR              |
| ICT < 43      | Normal          |            |           |            |                 |

### 15.4.18.4 ODU Protections

There are 3 ODU protections:

- Compressor overheating
- Heat sink overheating
- System over power

Operation logic of all protections is the same. The controlled input (CTT, HST, or PWR) is controlled by changing the protection level using the fuzzy logic algorithm according to the input level and the change rate.

There are two sets of POWER values, the selection of the values are set according to the state of the Power-Shed dry contact input. Power-Shed input open -> Power1 Power-Shed input sort -> Power2

The following table summarizes the basic levels of each protection.

| Protection level | Compressor Overheat - cool (CTT) | Compressor Overheat - heat (CTT) | Heat Sink (HST) | Power1 | Power2 |
|------------------|----------------------------------|----------------------------------|-----------------|--------|--------|
| Stop compressor  | 105                              | 105                              | 83              | 3600   | 2900   |
| Down 2           | 100                              | 100                              | 81              | 3400   | 2750   |
| Down 1           | 98                               | 95                               | 77              | 3200   | 2600   |
| Stop rise        | 95                               | 85                               | 75              | 3100   | 2450   |
| Normal           | 90                               | 80                               | 73              | 3050   | 2300   |

### 15.4.18.5 Total Protection Level Definition

The total protection level is defined by the higher level of protection received.

## 15.4.19 Deicing

### 15.4.19.1 Deicing Starting Conditions

Deicing operation will start when either one of the following conditions exist:

Case 1:  $OCT < OAT - DST$  AND  $TLD > DI$

Case 2:  $OCT < OAT - 12$  AND  $TLD > 30$  minutes.

Case 3: OCT is Invalid AND  $TLD > DI$

Case 4: Unit is just switched to STBY AND  $OCT < OAT - DST$

Case 5:  $NLOAD = 0$  AND  $OCT < OAT - DST$

Case 6: OAT is invalid AND  $OCT < DST$  AND  $TLD > DI$  AND Compressor ON Time > CTMR minutes

OCT - Outdoor Coil Temperature

OAT - Outdoor Air Temperature

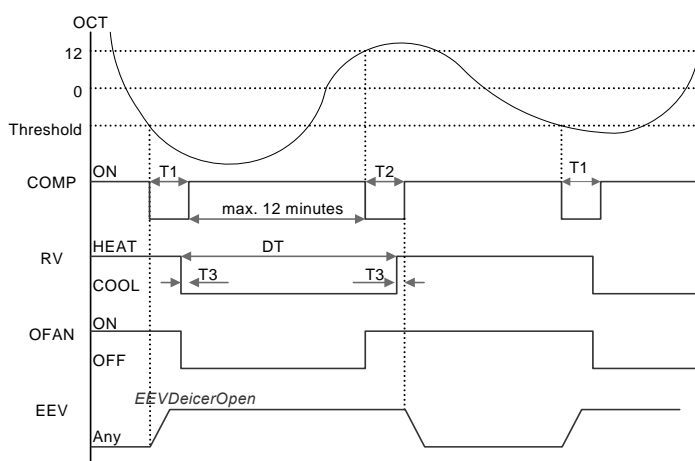
TLD - Time from Last Deicing

DI - Deicing Interval (Time Interval between Two Deicing) DST - Deicing static threshold (Temperature)

Deicing interval time when compressor is first started in heat mode, is 10 minutes if  $OCT < -2$ , and is 40 minutes in other cases.

Deicing interval time is changed (increased/ decreased in 10 minutes steps) as a function of deicing time. If deicing time is shorter than former deicing time, the deicing interval time will be increased. If deicing time is longer than former deicing time, the deicing interval time will be decreased.

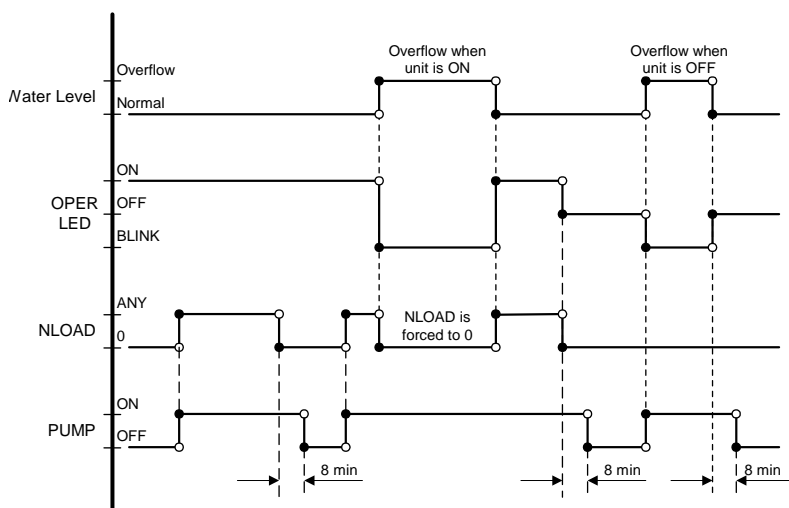
### 15.4.19.2 Deicing Starting Conditions



T1 = T2 = 36 seconds, T3 = 6 seconds

### 15.4.19.3 1 Level logic

| P2         | P3 | Level    |
|------------|----|----------|
| Don't care | 1  | Normal   |
| Don't care | 0  | Overflow |



## 15.5 Technician Test Mode

This test is aimed for the technicians to check the system under a preset compressor and outdoor fan values while the expansion valves will function according to the normal running mode.

### 15.5.1 Entering technician mode

- o This mode is entered through the outdoor unit using the HMI (refer to user interface section).
- o It can be selected either for cool or heat.
- o Technician test is not possible to enter during deicer.

### 15.5.2 Technician mode procedure

- All the connected indoor units will enter technician test at high indoor fan speed.
- The outdoor unit will be working normally (according to the run mode control logic) except the following changes:
  - o The dry contacts inputs will be ignored.
  - o Protections will be operative for stop compressor (not to be implemented in the current version).
  - o The compressor and the outdoor fan will be working in target preset values according to the following table:

| Technician Test |                  |      |            |
|-----------------|------------------|------|------------|
| Unit            | Compressor Speed |      | OFAN speed |
|                 | Cool             | Heat |            |
| Trio            | 60               | 75   | High speed |
| Quattro         | 60               | 75   | High speed |

### 15.5.3 Exiting technician mode

Technician mode will be exited either when:

- o Escaping by the HMI (exiting the ttC or ttH menus)
- o 60 minutes are passed from entering

## 15.6 User Interface

### LEDs Indicators - single split only

If any fault exists in the system, it will be shown according to tlf no fault exists in the system, no fault code will be displayed during normal operation mode, and the status led will be on while the compressor is enable. he following coding method.

**Two LEDs display** the system diagnostics on real time as follows:

**STATUS LED** is blinking 5 times in 5 seconds, and shut off for the next 5 seconds.

**FAULT LED** will blink during the same 5 seconds according to the following table:



| No  | Problem                                 | 5 | 4 | 3 | 2 | 1 |
|-----|---|---|---|---|---|---|
| 1   | OCT bad                                 | 0 | 0 | 0 | 0 | 1 |
| 2   | CTT bad                                 | 0 | 0 | 0 | 1 | 0 |
| 3   | HST bad                                 | 0 | 0 | 0 | 1 | 1 |
| 4   | OAT bad                                 | 0 | 0 | 1 | 0 | 0 |
| 5   | OMT bad                                 | 0 | 0 | 1 | 0 | 1 |
| 6   | RGT bad                                 | 0 | 0 | 1 | 1 | 0 |
| 7   | OFAN/Compressor Feedback Loss           | 0 | 0 | 1 | 1 | 1 |
| 8   | OFAN- IPM fault                         | 0 | 1 | 0 | 0 | 0 |
| 9   | OFAN Lock                               | 0 | 1 | 0 | 0 | 1 |
| 10  | OFAN- Vospd exceeded                    | 0 | 1 | 0 | 1 | 0 |
| 11  | Compressor- IPM Fault                   | 0 | 1 | 0 | 1 | 1 |
| 12  | Compressor Lock                         | 0 | 1 | 1 | 0 | 0 |
| 13  | Compressor- Vospd exceeded              | 0 | 1 | 1 | 0 | 1 |
| 14  | Compressor- Foldback                    | 0 | 1 | 1 | 1 | 0 |
| 15  | DC under voltage                        | 0 | 1 | 1 | 1 | 1 |
| 16  | DC over voltage                         | 1 | 0 | 0 | 0 | 0 |
| 17  | AC under voltage                        | 1 | 0 | 0 | 0 | 1 |
| 18  | No communication A                      | 1 | 0 | 0 | 1 | 0 |
| 19  | reserved                                | 1 | 0 | 0 | 1 | 1 |
| 20  | reserved                                | 1 | 0 | 1 | 0 | 0 |
| 21  | reserved                                | 1 | 0 | 1 | 0 | 1 |
| 22  | Compressor- Illegal Speed               | 1 | 0 | 1 | 1 | 0 |
| 23  | System Configuration Changed            | 1 | 0 | 1 | 1 | 1 |
| 24  | System Configuration Problem            | 1 | 1 | 0 | 0 | 0 |
| 25  | Heat sink Over Heating Fault/Protection | 1 | 1 | 0 | 0 | 1 |
| 26  | Deicing Protection                      | 1 | 1 | 0 | 1 | 0 |
| 27  | Compressor Over Heating Protection      | 1 | 1 | 0 | 1 | 1 |
| 28  | System over power Protection            | 1 | 1 | 1 | 0 | 0 |
| 29  | Bad EEPROM                              | 1 | 1 | 1 | 0 | 1 |
| 30  | Not Configured                          | 1 | 1 | 1 | 1 | 0 |
| 31: | Bad Communication                       | 1 | 1 | 1 | 1 | 1 |

**Notes:****1 - ON, 2 - OFF**

1. Whenever this table is updated, the installation test procedure, and the alarm output function should be updated.
2. Only one code is shown.
3. Order of priority is 1-32. Diagnostics is continuously ON as long as power is on.
4. Heat Sink Over Heating Protection, Compressor Over Heating Protection, and System Over Power Protection are declared only whenever in 'Stop-Compressor' status.
5. All faults, except the thermistor faults, will remain at least 10 seconds. This rule comes to serve the monitoring utilities, in a case the fault is released quickly it will be still shown under the monitoring utilities.
6. Thermistor faults are reported only when they are enabled.
7. When the outdoor unit is in fault (not protection), an in-fault signal is sent to the indoor. When all the outdoor unit faults are cleared, 'no-fault' signal is sent to the indoor.

## 15.7 Jumper settings

0 = open (disconnected)

1 = closed (shorted)

### 15.5.1 Indoor unit controller

#### Self test Jumper-J1

| Operation | J1 |
|-----------|----|
| SELF-TEST | 1  |
| NORMAL    | 0  |

#### Compensation Jumper - J2

| Model | J2(Default) | Compensation |
|-------|-------------|--------------|
| HAD24 | 1           | Activated    |

#### Family Selection Jumper - J3,J4,J5,J6,J11

| Family | J11 | J6 | J5 | J4 | J3 |
|--------|-----|----|----|----|----|
| HAD24  | 0   | 1  | 0  | 0  | 0  |

#### Model Selection Jumper - J7

| Model    | J7 |
|----------|----|
| HAD24    | 0  |
| Reserved | 1  |

#### Jumper J9

| Operation         | J9 |
|-------------------|----|
| Presence Detector | 0  |
| Power Shedding    | 1  |

#### Jumper J10

| Operation            | J10 |
|----------------------|-----|
| With new function    | 0   |
| Without new function | 1   |

#### Jumper J4

| Operation   | J14 |
|-------------|-----|
| LEX Display | 0   |
| HAD Display | 1   |

### 15.7.2 Outdoor unit controller

#### OFAN Jumpers

| OFAN use parameters   | J2 | J1 |
|-----------------------|----|----|
| Panasonic- EHD80      | 0  | 0  |
| Nidec SIC-71FW-F170-1 | 0  | 1  |
| Shinano               | 1  | 0  |
| EEPROM                | 1  | 1  |

#### Compressor Jumpers

| Compressor use parameters | J3 |
|---------------------------|----|
| TNB220FLBM (ROM)          | 0  |
| EEPROM                    | 1  |

## 15.8 System Parameters

### 15.8.1 General parameters

| Parameter    | Default Value |
|--------------|---------------|
| ODUCodeLimit | 6             |

**15.8.2 Protection Parameters**

| Deicer Parameters    |         |
|----------------------|---------|
| Parameter            | Default |
| <i>DST</i>           | 8       |
| <i>DSTF</i>          | 12      |
| <i>DIF (min)</i>     | 30      |
| <i>CTMR (min)</i>    | 15      |
| <i>TimeD (min)</i>   | 1       |
| <i>DIT (min)</i>     | 10      |
| <i>DTmin (min)</i>   | 3       |
| <i>Dlmin (min)</i>   | 30      |
| <i>Dlmax (min)</i>   | 120     |
| <i>DeicSPChRV</i>    | 0       |
| <i>EEVDeicerOpen</i> | 180     |
| <i>DEICT1 (sec)</i>  | 50      |
| <i>DEICT2 (sec)</i>  | 36      |
| <i>DEICT3 (sec)</i>  | 6       |
| <i>OptimDeicSP</i>   | 90      |

**15.8.3 Compressor Parameters**

| Compressor Parameters | Value |
|-----------------------|-------|
| <i>MinOFFTime</i>     | 3     |
| <i>MinOnTime</i>      | 3     |
| <i>MaxSpeedC</i>      | 75    |
| <i>MaxSpeedH</i>      | 95    |
| <i>Step1RPS</i>       | 40    |
| <i>Step2RPS</i>       | 60    |
| <i>Step3RPS</i>       | 75    |

**15.8.4 OFAN parameters**

| EEV Parameters               | Value |
|------------------------------|-------|
| <i>OFMinRPM</i>              | 150   |
| <i>OFMaxRPM</i>              | 1000  |
| <i>NightRPM</i>              | 650   |
| <i>OFMinTimeReduce (Sec)</i> | 60    |
| <i>OFLowSpC</i>              | 35    |
| <i>OFMedSpC</i>              | 50    |
| <i>OFLowSpH</i>              | 40    |
| <i>OFMedSpH</i>              | 65    |

**15.8.5 Indoor Units SW Parameters****15.8.5.1 General Parameters for All Models:**

Parameters defining the indoor fan speed as a function of Indoor Coil temperature in heat mode (ICT):

**15.8.5.1.1 Parameters for defrost protection;**

|             |  |    |
|-------------|--|----|
| ICTST Speed | ICT to stop indoor fan                       | 25 |
| ICTVLSpeed  | ICT to go down to very low speed             | 28 |
| ICTLSpeed   | ICT to start in very low speed               | 30 |
| ICTHSpeed   | ICT to start in increase speed from very low | 32 |
| ICTTSpeed   | ICT to enable Turbo fan speed                | 40 |
| ICTDefl     | ICT to go back to normal                     | 8  |
| ICTDef2     | ICT to 'stop rise' when ICT decrease         | 6  |
| ICTDef3     | ICT to 'stop rise' when ICT is stable        | 4  |
| ICTDef4     | ICT to 'Hz Down' when ICT decrease           | 2  |
| ICTDef5     | ICT to 'Hz Down' when ICT is stable          | 0  |
| ICTDef6     | ICT to stop compressor                       | -2 |

### 15.8.5.1.2 Parameters for indoor coil over heating protection:

|        |                                       |    |
|--------|---------------------------------------|----|
| ICTOH1 | ICT to go back to normal              | 45 |
| ICTOH2 | ICT to 'stop rise' when ICT increase  | 48 |
| ICTOH3 | ICT to 'stop rise' when ICT is stable | 52 |
| ICTOH4 | ICT to 'Hz Down' when ICT increase    | 55 |
| ICTOH5 | ICT to 'Hz Down' when ICT is stable   | 60 |
| ICTOH6 | ICT to stop compressor                | 62 |

### 15.8.5.2 Model Depended Parameters:

| Parameter name  | Wall Mounted Models |      |      | Floor/Ceiling Models |     |    | Cassette Models |    |    | Ducted Models |     |
|---|---------------------|------|------|----------------------|-----|----|-----------------|----|----|---------------|-----|
|   | 25                  | 35   | 50   | 25                   | 35  | 50 | 25              | 35 | 50 | 35            | 50  |
| NLOAD limits as a function of selected indoor fan speed |                     |      |      |                      |     |    |                 |    |    |               |     |
| MaxNLOADIF1C  | 40                  | 40   | 45   | 40                   | 40  | 40 | 40              | 40 | 40 | N/A           | N/A |
| MaxNLOADIF2C  | 53                  | 53   | 62   | 53                   | 53  | 60 | 53              | 56 | 60 | N/A           | N/A |
| MaxNLOADIF3C  | 120                 | 120  | 120  | 120                  | 120 | 90 | 120             | 90 | 90 | N/A           | N/A |
| MaxNLOADIF4C  | 127                 | 127  | 127  | 127                  | 127 | 90 | 127             | 90 | 90 | N/A           | N/A |
| MaxNLOADIF5C  | 127                 | 127  | 127  | 127                  | 127 | 90 | 127             | 90 | 90 | N/A           | N/A |
| <b>Indoor Fan speeds</b>                                |                     |      |      | <b>Fix RPM Motor</b> |     |    |                 |    |    |               |     |
| IFVLOWC   | 700                 | 700  | 700  |                      |     |    |                 |    |    |               |     |
| IFLOWC  | 800                 | 800  | 900  |                      |     |    |                 |    |    |               |     |
| IFMEDC  | 900                 | 950  | 1050 |                      |     |    |                 |    |    |               |     |
| IFHIGHC   | 1050                | 1100 | 1200 |                      |     |    |                 |    |    |               |     |
| IFTURBOC  | 1150                | 1200 | 1250 |                      |     |    |                 |    |    |               |     |
| IFVLOWH   | 700                 | 700  | 700  |                      |     |    |                 |    |    |               |     |
| IFLOWH  | 800                 | 850  | 900  |                      |     |    |                 |    |    |               |     |
| IFMEDH  | 950                 | 1000 | 1100 |                      |     |    |                 |    |    |               |     |
| IFHIGHH   | 1100                | 1150 | 1250 |                      |     |    |                 |    |    |               |     |
| IFTURBOH  | 1200                | 1250 | 1300 |                      |     |    |                 |    |    |               |     |

## 16. TROUBLESHOOTING [GC 24]

### **WARNING!!!**

When Power Up – the whole outdoor unit controller, including the wiring, is under  
HIGH VOLTAGE!!!

Never open the Outdoor unit before turning off the Power!!!

When turned off, the system is still charged (400V)!!!

It takes about 1 Min. to discharge the system.

Touching the controller before discharging may cause an electrical shock!!!

### 16.1 General System Failures and Corrective Actions

| No | Symptom  | Probable Cause                                     | Corrective Action  |
|----|--|--|--|
| 1  | Indoor unit power supply indicator (Red LED) does not light up.                                    | No power supply                                    | Check power supply. If OK, check display and display wiring. if OK, replace controller   |
| 2  | Indoor unit does not respond to remote control message   | Remote control message not reached the indoor unit | Check remote control batteries, if OK, check display and display wiring, if OK, replace display PCB. If still not OK replace controller  |
| 3  | Indoor unit responds to remote control message but Operate indicator (Green LED) does not light up | Problem with display PCB                           | Replace display PCB. If still not OK replace controller  |
| 4  | Indoor fan does not start (louvers are opened and Green LED is ON)                                 | Unit in heat mode and coil is still not warm       | Change to cool mode  |
|    |  | Outdoor unit is in opposite mode                   | Change operation mode  |
|    |  | Problem with controller or capacitor               | Change to high speed and Check power supply to motor is higher than 130VAC (for triack controlled motor) or higher than 220VAC for fixed speed motors, if OK replace capacitor, if not OK replace controller |
| 5  | Indoor fan works when unit is OFF, and indoor fan speed is not changed by remote control command.  | Controller problem                                 | Replace controller   |
| 6  | Water leakage from indoor unit   | Indoor unit drainage tube is blocked               | Check and open drainage tube   |

| No | Symptom   | Probable Cause                            | Corrective Action   |
|----|---|---|---|
| 7  | Outdoor unit display board and leds are off                                     | No power supply                           | Check the connections and the wiring on the main terminal - Repair if needed. |
|    |   | PFC Chock coil                            | Check the PFC Chock coil  |
|    |   | Burnt fuse                                | Check 20A fuse on the Filter  |
| 8  | Compressor operates but no capacity   | EEV problem                               | Check EEV   |
|    |   | Refrigerant leakage                       | Check refrigeration system  |
|    |   | Indoor coil block                         | Clean filters and/or remove block   |
|    |   | Outdoor coil block                        | Remove block and/or avoid air by-pass   |
| 9  | Compressor is over heated and unit does not generate capacity                   | EEV problem                               | Check EEV   |
|    |   | Refrigerant leakage                       | Check refrigeration system)   |
|    |   | Indoor coil block                         | Clean filters and/or remove block   |
|    |   | Outdoor coil block                        | Remove block and/or avoid air by-pass   |
| 10 | Compressor stops during operation   | Electronic control                        | Check diagnostics   |
|    |   | Refrigerant leakage                       | Check refrigeration system  |
| 11 | Unit is not operating   | Communication problems                    | Check diagnostics   |
| 12 | Compressor does not start   | Electronics control problem or protection |   |
| 13 | Unit works in wrong mode (cool instead of heat or heat instead of cool)         | Electronics or RV problem                 | Check RV  |
| 14 | All components are operating properly but no cooling or no heating              | Refrigerant leak                          | Check refrigeration system  |
| 15 | Compressor motor is generating noise and no suction occurs                      | Phase order to compressor is wrong        | Check compressor phase order  |
| 16 | Freezing of outdoor unit in heat mode and outdoor unit base is blocked with ice |   | Connect base heater   |
| 17 | The unit stop suddenly during operation   | EMC interference to the A/C unit          | Check for EMC problems  |
| 18 | Indoor unit(s) Indicator(s) leds may flicker                                    |   |   |

| No | Symptom  | Probable Cause                               | Corrective Action      |
|----|--|--|------------------------|
| 21 | Other home appliances operation is faulty such as noise appears in the television picture, or the picture is distorted or static occurs in the radio sound | EMC interference by the A/C unit             | Check for EMC problems |
| 22 | All others   | Specific problems of indoor or outdoor units | Check diagnostics      |

## 16.2 Checking the refrigeration system

Checking system pressures and other thermodynamic measures should be done when system is in technician Mode where the system operates as in fixed settings. The performance curves given in this manual are given for unit performance in Technician mode when high indoor fan speed is selected.

## 16.3 Diagnostics

### 16.3.1 Outdoor unit diagnostics

#### LED's Indicators - Single split only

If any fault exists in the system, it will be shown according to the following coding method. If no fault exists in the system, no fault code will be displayed during normal operation mode, and the status led will be on while the compressor is enabled.

**Two LEDs display** the system diagnostics on real time as follows:

**STATUS LED** is blinking 5 times in 5 seconds, and shut off for the next 5 seconds.

**FAULT LED** will blink during the same 5 seconds according to the following table:

| No | Problem                                 | 5 | 4 | 3 | 2 | 1 |
|----|---|---|---|---|---|---|
| 1  | OCT bad                                 | 0 | 0 | 0 | 0 | 1 |
| 2  | CTT bad                                 | 0 | 0 | 0 | 1 | 0 |
| 3  | HST bad                                 | 0 | 0 | 0 | 1 | 1 |
| 4  | OAT bad                                 | 0 | 0 | 1 | 0 | 0 |
| 5  | OMT bad                                 | 0 | 0 | 1 | 0 | 1 |
| 6  | RGT bad                                 | 0 | 0 | 1 | 1 | 0 |
| 7  | OFAN/Compressor Feedback Loss           | 0 | 0 | 1 | 1 | 1 |
| 8  | OFAN- IPM fault                         | 0 | 1 | 0 | 0 | 0 |
| 9  | OFAN Lock                               | 0 | 1 | 0 | 0 | 1 |
| 10 | OFAN- Vospd exceeded                    | 0 | 1 | 0 | 1 | 0 |
| 11 | Compressor- IPM Fault                   | 0 | 1 | 0 | 1 | 1 |
| 12 | Compressor Lock                         | 0 | 1 | 1 | 0 | 0 |
| 13 | Compressor- Vospd exceeded              | 0 | 1 | 1 | 0 | 1 |
| 14 | Compressor- Foldback                    | 0 | 1 | 1 | 1 | 0 |
| 15 | DC under voltage                        | 0 | 1 | 1 | 1 | 1 |
| 16 | DC over voltage                         | 1 | 0 | 0 | 0 | 0 |
| 17 | AC under voltage                        | 1 | 0 | 0 | 0 | 1 |
| 18 | No communication A                      | 1 | 0 | 0 | 1 | 0 |
| 19 | reserved                                | 1 | 0 | 0 | 1 | 1 |
| 20 | reserved                                | 1 | 0 | 1 | 0 | 0 |
| 21 | reserved                                | 1 | 0 | 1 | 0 | 1 |
| 22 | Compressor- Illegal Speed               | 1 | 0 | 1 | 1 | 0 |
| 23 | System Configuration Changed            | 1 | 0 | 1 | 1 | 1 |
| 24 | System Configuration Problem            | 1 | 1 | 0 | 0 | 0 |
| 25 | Heat sink Over Heating Fault/Protection | 1 | 1 | 0 | 0 | 1 |
| 26 | Deicing Protection                      | 1 | 1 | 0 | 1 | 0 |
| 27 | Compressor Over Heating Protection      | 1 | 1 | 0 | 1 | 1 |
| 28 | System over power Protection            | 1 | 1 | 1 | 0 | 0 |
| 29 | Bad EEPROM                              | 1 | 1 | 1 | 0 | 1 |
| 30 | Not Configured                          | 1 | 1 | 1 | 1 | 0 |
| 31 | Bad Communication                       | 1 | 1 | 1 | 1 | 1 |

**Notes:****1 - ON, 0 - OFF**

1. Whenever this table is updated, the installation test procedure, and the alarm output function should be updated.
2. Only one code is shown.
3. Order of priority is 1-32. Diagnostics is continuously ON as long as power is on.
4. Heat Sink Over Heating Protection, Compressor Over Heating Protection, and System Over Power Protection are declared only whenever in 'Stop-Compressor' status.
5. All faults, except the thermistor faults, will remain at least 10 seconds. This rule comes to serve the monitoring utilities, in a case the fault is released quickly it will be still shown under the monitoring utilities.
6. Thermistor faults are reported only when they are enabled.

When the outdoor unit is in fault (not protection), an in-fault signal is sent to the indoor. When all the outdoor unit faults are cleared, 'no-fault' signal is sent to the indoor.



### 16.3.2 Outdoor fault corrective actions

| No | Fault Name                    | Probable Cause   | Corrective Action   |
|----|-------------------------------|--|---|
| 1  | OCT bad                       | Thermistor not connected or damaged  | Check Thermistor  |
| 2  | CTT bad                       |  |   |
| 3  | HST bad                       |  |   |
| 4  | OAT bad                       |  |   |
| 5  | TSUC bad                      |  |   |
| 6  | RGT bad                       |  |   |
| 7  | OFAN/Compressor Feedback Loss | OFAN halls or wires bad.<br>Compressor wire cable bad or IPM bad or compressor bad | Check OFAN motor and compressor   |
| 8  | OFAN - IPM fault              | Over current / Over temperature of OFAN IPM  | Check no obstruction to controller air opening<br>Check OFAN motor<br>Check motor type matches motor jumpers in controller  |
| 9  | OFAN Lock                     | Fan does not rotate  | Check OFAN motor  |
| 10 | OFAN- Vospd exceeded          | Exceeds speed high limit   | Check motor type matches motor jumpers in controller<br>Make necessary arrangements in unit installation location to avoid back wind<br>Avoid EMC problems  |
| 11 | Compressor- IPM Fault         | Over current / Over temperature of compressor IPM                                  | Check no obstruction to controller air opening<br>Check Compressor  |
| 12 | Compressor Lock               | Compressor does not rotate   | Check Compressor  |
| 13 | Compressor- Vospd exceeded    | Exceeds speed limit  | Try again and replace controller if still have the problem  |
| 14 | Compressor- Foldback          | High pressure / Current reduces compressor speed                                   | Check Compressor  |
| 15 | DC under voltage              | DC voltage is lower than limit   | Replace controller  |
| 16 | DC over voltage               | DC voltage exceeds its high limit  | Check if input voltage higher than limit (270VAC), if not and the problem persists, replace controller. If voltage is high, shut off the power and recommend the customer to fix the power supply |
| 17 | AC under voltage              | AC input voltage is lower than limit   | Check if input voltage lower than limit (170VAC), if not and the problem persists, replace controller. If voltage is low, recommend the customer to fix the power supply                          |

| No | Fault Name                               | Probable Cause  | Corrective Action  |
|----|--|---|--|
| 18 | No communication A                       | No signals in line A  | Check communication  |
| 19 | Compressor- Illegal Speed                | Exceeds speed low limit   | See # 13   |
| 20 | System Configuration Changed             | Communication lines changed from last operation   | No problem just an announcement  |
| 21 | System Configuration Problem             | Miss-match between the IDUs connected to port A,B,C or D, or the total capacity code of IDUs is higher than the ODU maximum capacity code | Change configuration if needed.  |
| 22 | Heat sink Over Heating Fault/ Protection | Compressor stopped due to heatsink protection   | Check that the airflow around the ODU is free and the fan is running free. Check fan motor (0) |
| 23 | Deicing Protection                       | During deicing procedure  | No action required   |
| 24 | Compressor Over Heating Protection       | Compressor stopped due to over heat protection  | Check if gas is missing in the system  |
| 25 | System over power Protection             | Compressor stopped due to over power protection   | No action required   |
| 26 | Bad EEPROM                               | EEPROM not operating  | Power reset. (Replace Controller just in case you need EEPROM).                                |
| 27 | Not Configured                           | Cannot start the control  | Power reset. Replace Controller if didn't help   |
| 28 | Bad Communication                        | Bad communication lines   | See # 18-21  |

### 16.3.3 Fault Code for Indoor unit

Pressing Mode button for long will activate diagnostic mode by the acknowledgment of 3 short beeps and lighting of COOL and HEAT LED's.

Entering diagnostics in STBY mode allows only viewing of status (fault-display).

In diagnostic mode, system problems / information will be indicated by blinking of Heat & Cool LED's.

The coding method will be as follows:

Heat led will blink 5 times in 5 seconds, and then will be shut off for the next 5 seconds. Cool Led will blink during the same 5 seconds according to the following table

| No  | Fault Name                | 5 | 4 | 3 | 2 | 1 |
|-----|---------------------------|---|---|---|---|---|
| 1   | RT-1 is disconnected      | 0 | 0 | 0 | 0 | 1 |
| 2   | RT-1 is shorted           | 0 | 0 | 0 | 1 | 0 |
| 3   | RT-2 is disconnected      | 0 | 0 | 0 | 1 | 1 |
| 4   | RT-2 is shorted           | 0 | 0 | 1 | 0 | 0 |
| ... | Reserved                  | 0 | 0 | 1 | 0 | 1 |
| 7   | Communication mismatch    | 0 | 0 | 1 | 1 | 1 |
| 8   | No Communication          | 0 | 1 | 0 | 0 | 0 |
| 9   | No Encoder                | 0 | 1 | 0 | 0 | 1 |
| 10  | Reserved                  | 0 | 1 | 0 | 1 | 0 |
| 11  | Outdoor Unit Fault        | 0 | 1 | 0 | 1 | 1 |
| ... | Reserved                  |   |   |   |   |   |
| 17  | Defrost protection        | 1 | 0 | 0 | 0 | 1 |
| 18  | Deicing Protection        | 1 | 0 | 0 | 1 | 0 |
| 19  | Outdoor Unit Protection   | 1 | 0 | 0 | 1 | 1 |
| 20  | Indoor Coil HP Protection | 1 | 0 | 1 | 0 | 0 |
| 21  | Overflow Protection       | 1 | 0 | 1 | 0 | 1 |
| ... | Reserved                  |   |   |   |   |   |
| 24  | EEPROM Not Updated        | 1 | 1 | 0 | 0 | 0 |
| 25  | Bad EEPROM                | 1 | 1 | 0 | 0 | 1 |
| 26  | Bad Communication         | 1 | 1 | 0 | 1 | 0 |
| 27  | Using EEPROM data         | 1 | 1 | 0 | 1 | 1 |
| 28  | Model A                   | 1 | 1 | 1 | 0 | 0 |
| 29  | Model B                   | 1 | 1 | 1 | 0 | 1 |
| 30  | Model C                   | 1 | 1 | 1 | 1 | 0 |
| 31  | Model D                   | 1 | 1 | 1 | 1 | 1 |

**1 - ON, 0 - OFF**

Only one code is shown. Order of priority is lower to the higher number. Diagnostics is continuously ON as long power is on.

### 16.3.4 Indoor unit diagnostics and corrective actions

| No.   | Fault                  | Probable Cause   | Corrective Action   |
|-------|------------------------|--|---|
| 1-4   | Sensor failures        | Sensors not connected or damaged                           | Check sensor connections or replace sensor  |
| 7     | Communication mismatch | Indoor and Outdoor controllers are with different versions | Replace Indoor controller   |
| 8     | No Communication       | Communication or grounding wiring is not good              | Check Indoor to Outdoor wiring and grounding  |
| 9     | No Encoder             | Indoor electronics or motor                                | Check motor wiring, if ok, replace motor, if still not ok, replace Indoor controller. |
| 11    | Outdoor Unit Fault     | Outdoor controller problem                                 | Switch to Outdoor diagnostics.  |
| 17-21 | Protections            | Indication   | No action   |
| 24    | EEPROM Not Updated     | System is using ROM parameters and not EEPROM parameters   | No action, unless special parameters are required for unit operation.                 |
| 25    | Bad EEPROM             |  | No action, unless special parameters are required for unit operation.                 |
| 26    | Bad Communication      | Communication quality is low reliability                   | Check Indoor to Outdoor wiring and grounding  |
| 27    | Using EEPROM data      | No problem   |   |
| 28-31 | IDU model              |  |   |

## 16.4 Procedures for checking Main Parts

### 16.4.1 Checking Mains Voltage

Confirm that the Mains voltage is between 198 and 264 VAC. If Mains voltage is out of this range, abnormal operation of the system is expected. If in range check the Power (Circuit) Breaker and look for broken or loosed cable lugs or wiring mistake(s).

### 16.4.2 Checking Main fuse

Check 20A fuse on the Filter Board - If burnt – check the compressor, fan or any other peripheral that can cause a short. In case of a problematic peripheral - replace it.

In case no problematic peripheral, check the resistance on the DC bank (B+ & B- on the Power board), if it is less than 30 $\Omega$ , replace the controller. Otherwise replace the burnt fuse. In case of frequent burning fuse, replace the controller.

### 16.4.3 Checking PFC Chock coil

Check PFC chock connection – repair if needed.

Dis-connect the chock from the controller wire extensions, check if the 2 wires of the chock are shorted. If shorted (OK) check between each wire and the metal box. If shorted replace chock, if not (OK), open the controller top cover and check if the wire extensions are connected well and if shorted. If not shorted, replace wires, if shorted (OK) than might be a controller problem – replace controller.

#### 16.4.4 Checking the Outdoor Fan Motor

Check FAN-Power and FAN-Halls connections - Repair if needed.

Rotate the fan slowly by hand. If the fan does not rotate easily, check whether something is obstructing the fan, or if the fan itself is coming into contact with the outer case, preventing it from rotating. Correct if necessary - otherwise, the fan motor bearings have seized. Replace the motor.

If the fan rotates easily, use a current probe ("Clamp") to assure AC current on each phase and it is less than 1A.

In case there is no current, check the resistance between the three poles. Assure the three coil resistances are almost the same.

The normal value should be between  $10\Omega$  to  $20\Omega$ .

Change to Stand-by or Power OFF and re-start - If the fault is still active - replace controller.

#### 16.4.5 Checking the Compressor

Check Compressor connections - Repair if needed.

Use a current probe ("Clamp") to assure that there is an AC current on each phase – no more than 15A.

In case there is no current, check the resistance between the three poles. Assure the three coil resistances are almost the same (between  $0.8\Omega$  to  $1.5\Omega$ ).

Change to Stand-by or Power OFF and re-start - If the fault is still "Active" - replace controller.

#### 16.4.6 Checking the Reverse Valve (RV)

The RV has two parts, Solenoid and valve.

Solenoid - Running in heating mode, check the voltage between two pins of reverse valve connector, normal voltage is 230VAC. if no power supply to RV, Check RV operation with direct 230VAC power supply, if OK, replace outdoor controller.

Valve - if RV solenoid is OK (as above) but still no heating operation while compressor is On, replace the valve.

#### 16.4.7 Checking the electrical expansion valve (EEV)

The EEV has two parts, drive and valve.

When Outdoor unit is powered on, EEV shall run and have click and vibration.

For assuring the problem is of the EEV parts, perform the installation test and if fails and no other indications in the diagnostics, than the problem is with the EEV (one or more).

Drive - a step motor; ringed on the valve. Check the drive voltage, should be 12VDC.

Valve – if drive is OK (as above) but still the indoor unit perform no conditioning replace the valve (no need to take out the refrigerant, just pump down and shut off the main valves).

#### 16.4.8 Checking the thermistors

Check Thermistor connections and wiring - Repair if needed.

Check Thermistor resistance – between  $0^{\circ}\text{C}$  and  $40^{\circ}\text{C}$  should be between  $35\text{K}\Omega$  and  $5\text{K}\Omega$ .

#### 16.4.9 Checking the communication

Change to Stand-by or Power OFF and re-start - If the fault is still "Active" check Indoor to Outdoor.

Communication wiring and grounding connections (should be less than  $2.0\Omega$ ) - Repair if needed.

If IDU failure – replace IDU controller that does not respond.

If ODU failure – replace ODU.

## 16.4.10 Checking for electromagnetic interference (EMC problems)

### 16.4.10.1 EMC troubles to the A/C unit

#### EMC troubles to the A/C unit

##### Locations most susceptible to noise :

1. Locations near broadcast stations where there are strong electromagnetic waves.
2. Locations near amateur radio (short wave) stations.
3. Locations near electronic sewing machines and arc-welding machines.

##### Trouble :

Either of the following trouble may occur:

1. The unit may stop suddenly during operation.
2. Indicator lamps may flicker

##### Correction :

The fundamental concept is to make the system less susceptible to noise (insulate for noise or distance from the noise source):

1. Use shielded wires.
2. Move unit away from the noise source.

### 16.4.10.2 EMC troubles to near by home applications

#### Locations most susceptible to noise :

1. A television or radio is located near the A/C and A/C wiring.
2. The antenna cable for a television or radio is located close to the A/C and A/C wiring.
3. Locations where television and radio signals are weak.

#### Trouble :

1. Noise appears in the television picture, or the picture is distorted.
2. Static occurs in the radio sound.

#### Correction

1. Select a separate power source.
2. Keep the A/C and A/C wiring at least 1 meter away from wireless devices and antenna cables.
3. Change the wireless device's antenna to a high sensitivity antenna.
4. Change the antenna cable to a BS coaxial cable.
5. Use a noise filter (for the wireless device).
6. Use a signal booster.

## 16.5 Precaution, Advise and Notice Items

### 16.5.1 High voltage in Outdoor unit controller

Whole controller, including the wires, connected to the Outdoor unit controller may have the potential hazard voltage when power is on. Touching the Outdoor unit controller may cause an electrical shock.

Advise: Don't touch the naked lead wire and don't insert finger, conductor or anything else into the controller when power is on.

### 16.5.2 Charged Capacitors

Three large-capacity electrolytic capacitors are used in the Outdoor unit controller. Therefore, charging voltage (380VDC) remains after power down. Discharging takes about one minute after turned off. Touching the Outdoor unit controller before discharging may cause an electrical shock. When open the Outdoor unit controller cover, don't touch the soldering pin by hand or by any conductive material.

**Advise:**

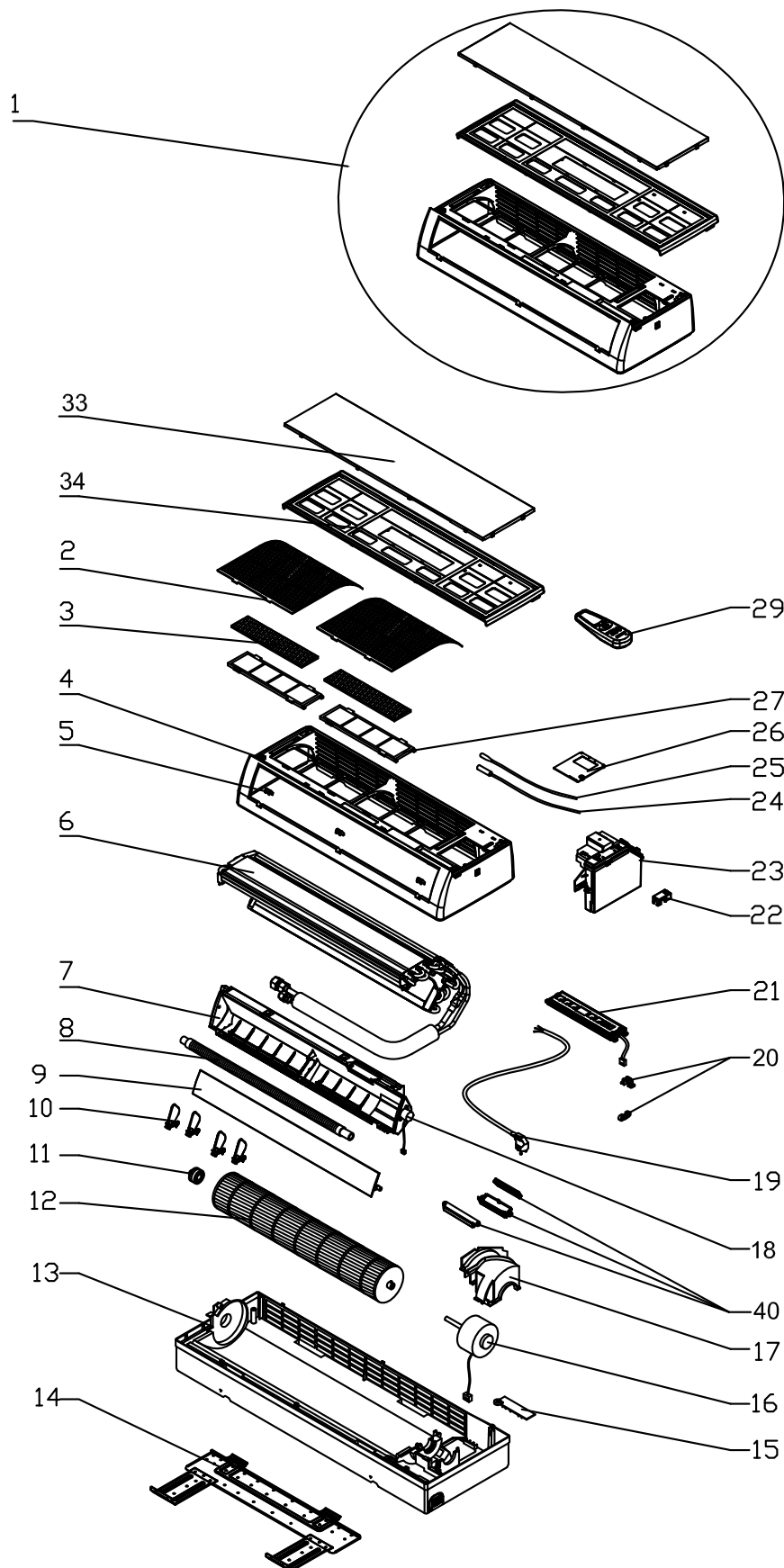
- Open the Outdoor unit controller cover only after one minute from power off.
- Measure the electrolytic capacitors voltage before farther checking controller.

**Additional advises**

- When disassemble the controller or the front panel, turn off the power supply.
- When connecting or disconnecting the connectors on the PCB, hold the whole housing, don't pull the wire.
- There are sharp fringes and sting on shell. Use gloves when disassemble the A/C units.

## 17. EXPLODED VIEWS AND SPARE PARTS LISTS

### 17.1 Indoor Unit: HAD007 / HAD009 / HAD012



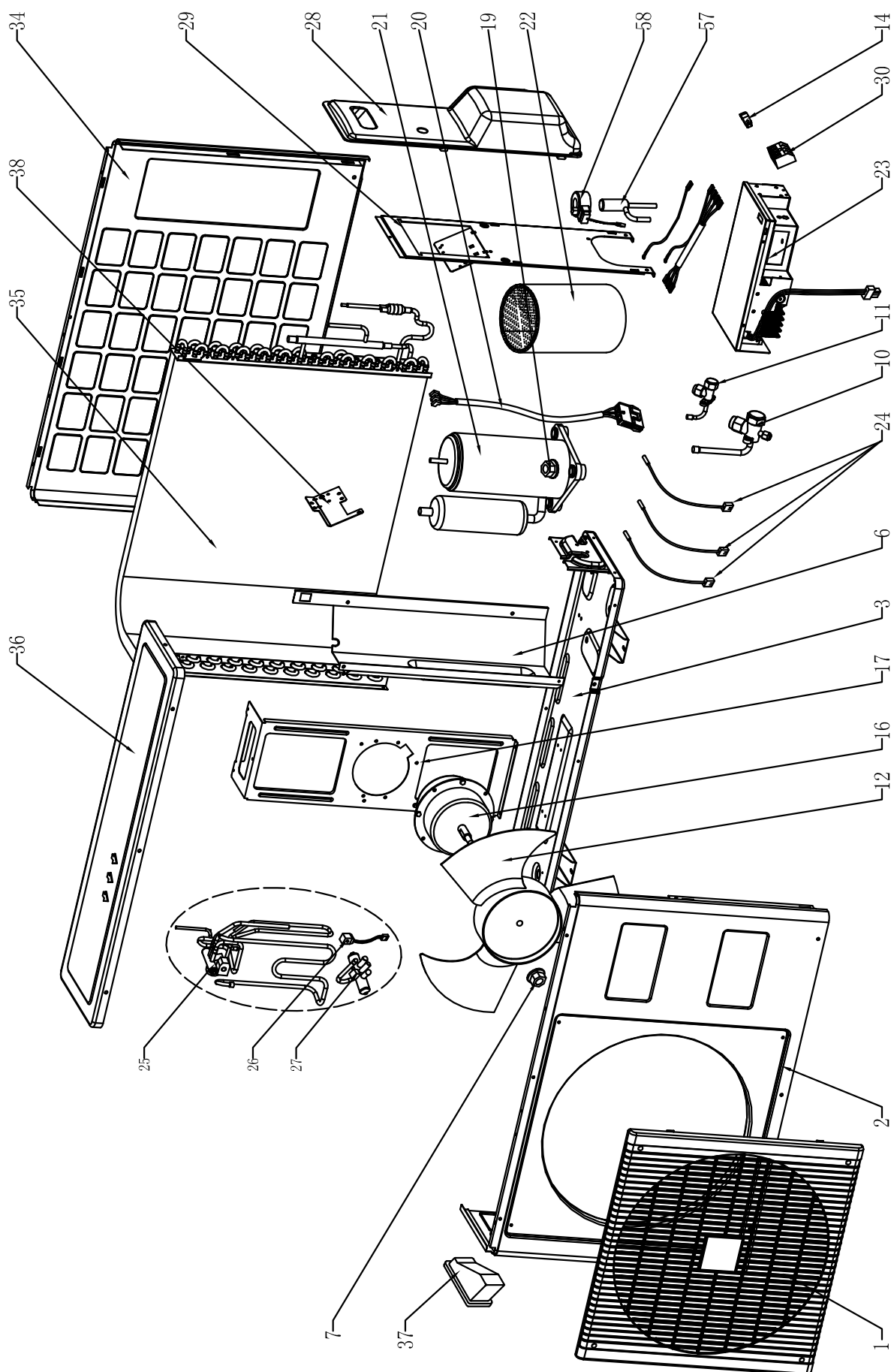


## 17.2 Indoor Unit: HAD007 / HAD009

| Drawing NO. | Component  | Item Description                               | Quantity |
|-------------|------------|--|----------|
| 1           | 465720334  | Front frame & Front Plate Assy.Electra         | 1        |
| 1           | 465720338  | Front frame & Front Plate Assy.Airwell         | 1        |
| 1           | 465720342  | Front frame & Front Plate Assy.Johnson         | 1        |
| 1           | 465720327  | Front frame & Front Plate Assy.Electra(Israel) | 1        |
| 2           | 453036500  | Air Filter                                     | 2        |
| 3           | 470500005  | Nanometer Photocatalysis Deodorant Filter      | 1        |
| 3           | 470500008  | Biological Sterilization Filter                | 1        |
| 4           | 465720212  | Front Frame Assy./HAD-7/9                      | 1        |
| 5           | 4525987    | SCREW COVER                                    | 3        |
| 6           | 453070701  | Evap. System Assy./DELTA 22,25                 | 1        |
| 7           | 465120015  | Air Outlet Frame/HAD-7/9                       | 1        |
| 8           | 465210009  | Drain Pipe for Israel /WNG18/24/30             | 1        |
| 9           | 465120017  | Louver/HAD-7/9                                 | 1        |
| 10          | 4525992    | VER. FLAP A                                    | 8        |
| 10          | 4525993    | VER. FLAP B                                    | 2        |
| 11          | 4523526    | BERAING ASSY FAN                               | 1        |
| 12          | 453264200  | Impeller Fan                                   | 1        |
| 13          | 4526659    | REAR PANEL ASSY                                | 1        |
| 14          | 464220008  | Mount Bracket./Low Cost ALPHA 9                | 1        |
| 15          | 4526000    | TUBE CLIP                                      | 1        |
| 16          | 453088600R | PG Resin motor 12W                             | 1        |
| 17          | 4525998    | MOTEOR COVER                                   | 1        |
| 18          | 4523507    | Step motor                                     | 1        |
| 19          | 455013702R | Power Cord Without Plug/3G/1.0/2100            | 1        |
| 20          | 4525988    | CABLE LOCKER                                   | 1        |
| 21          | 467300228R | Display / HAD                                  | 1        |
| 22          | 465360037  | Sensor Holder/HAD-7/9/12                       | 1        |
| 23          | 467300230R | Controller / DCI HAD IDU 25/35                 | 1        |
| 24          | 438082     | Thermistor Indoor coil □BLACK□                 | 1        |
| 25          | 4519813    | Thermistor room                                | 1        |
| 26          | 465340008  | Terminal Cover/ ALPHA7/9 Flat-Type             | 1        |
| 27          | 4525990    | Filter bracket                                 | 2        |
| 29          | 467200012R | Remote controller RC-4                         | 1        |
| 33          | 465020125  | Flat Panel/HAD-7/9                             | 1        |
| 34          | 465020123  | Front panel/HAD-7/9                            | 1        |
| 40          | 465340070  | Ionizer Holder/HAD-7/9/12                      | 1        |
| 40          | 467480009  | Ionizer/Bi-Polar                               | 1        |

### 17.3 Indoor Unit: HAD012

| Drawing NO. | Component  | Item Description                               | Quantity |
|-------------|------------|--|----------|
| 1           | 465720335  | Front frame & Front Plate Assy.Electra         | 1        |
| 1           | 465720339  | Front frame & Front Plate Assy.Airwell         | 1        |
| 1           | 465720343  | Front frame & Front Plate Assy.Johnson         | 1        |
| 1           | 465720328  | Front frame & Front Plate Assy.Electra(Israel) | 1        |
| 2           | 453082900  | Filter for DELTA 12                            | 2        |
| 3           | 470500006  | Nanometer Photocatalysis Deodorant Filter      | 1        |
| 3           | 470500009  | Biological Sterilization Filter                | 1        |
| 4           | 465720213  | Front Frame Assy./HAD35                        | 1        |
| 5           | 4525987    | SCREW COVER                                    | 3        |
| 6           | 453058201  | Evap. System Assy./DELTA35                     | 1        |
| 7           | 465120016  | Air Outlet Frame/HAD35                         | 1        |
| 8           | 465210009  | Drain Pipe for Israel /WNG18/24/30             | 1        |
| 9           | 465120018  | Louver/HAD-12                                  | 1        |
| 10          | 4525992    | VER. FLAP A                                    | 9        |
| 10          | 4527510    | Vertical Flap B                                | 3        |
| 11          | 4523526    | BERAING ASSY FAN                               | 1        |
| 12          | 4527111    | Impeller Fan                                   | 1        |
| 13          | 4527186    | REAR PANEL ASSY                                | 1        |
| 14          | 464220007  | Mount Bracket                                  | 1        |
| 15          | 4526000    | TUBE CLIP                                      | 1        |
| 16          | 453088600R | PG Resin motor 12W                             | 1        |
| 17          | 4525998    | MOTEOR COVER                                   | 1        |
| 18          | 4523507    | Step motor                                     | 1        |
| 19          | 455013700R | Power Cord Without Plug/3G/1.5/2100            | 1        |
| 20          | 4525988    | CABLE LOCKER                                   | 1        |
| 21          | 467300228R | Display / HAD                                  | 1        |
| 22          | 465360037  | Sensor Holder/HAD-7/9/12                       | 1        |
| 23          | 467300230R | Controller / DCI HAD IDU 25/35                 | 1        |
| 24          | 438082     | Thermistor Indoor coil □BLACK□                 | 1        |
| 25          | 4519813    | Thermistor room                                | 1        |
| 26          | 465340008  | Terminal Cover                                 | 1        |
| 27          | 4527508    | Filter bracket                                 | 2        |
| 29          | 467200012R | Remote controller RC-4                         | 1        |
| 33          | 465020126  | Flat Panel/HAD&HAF-12                          | 1        |
| 34          | 465020124  | Front panel/HAD&HAF-12                         | 1        |
| 40          | 465340070  | Ionizer Holder/HAD-7/9/12                      | 1        |
| 40          | 467480009  | Ionizer/Bi-Polar                               | 1        |

**17.4 Outdoor Unit: GC 7 RC / GC 9 RC / GC 12 RC DCI**

## 17.5 Outdoor Unit: GC 7 RC DCI

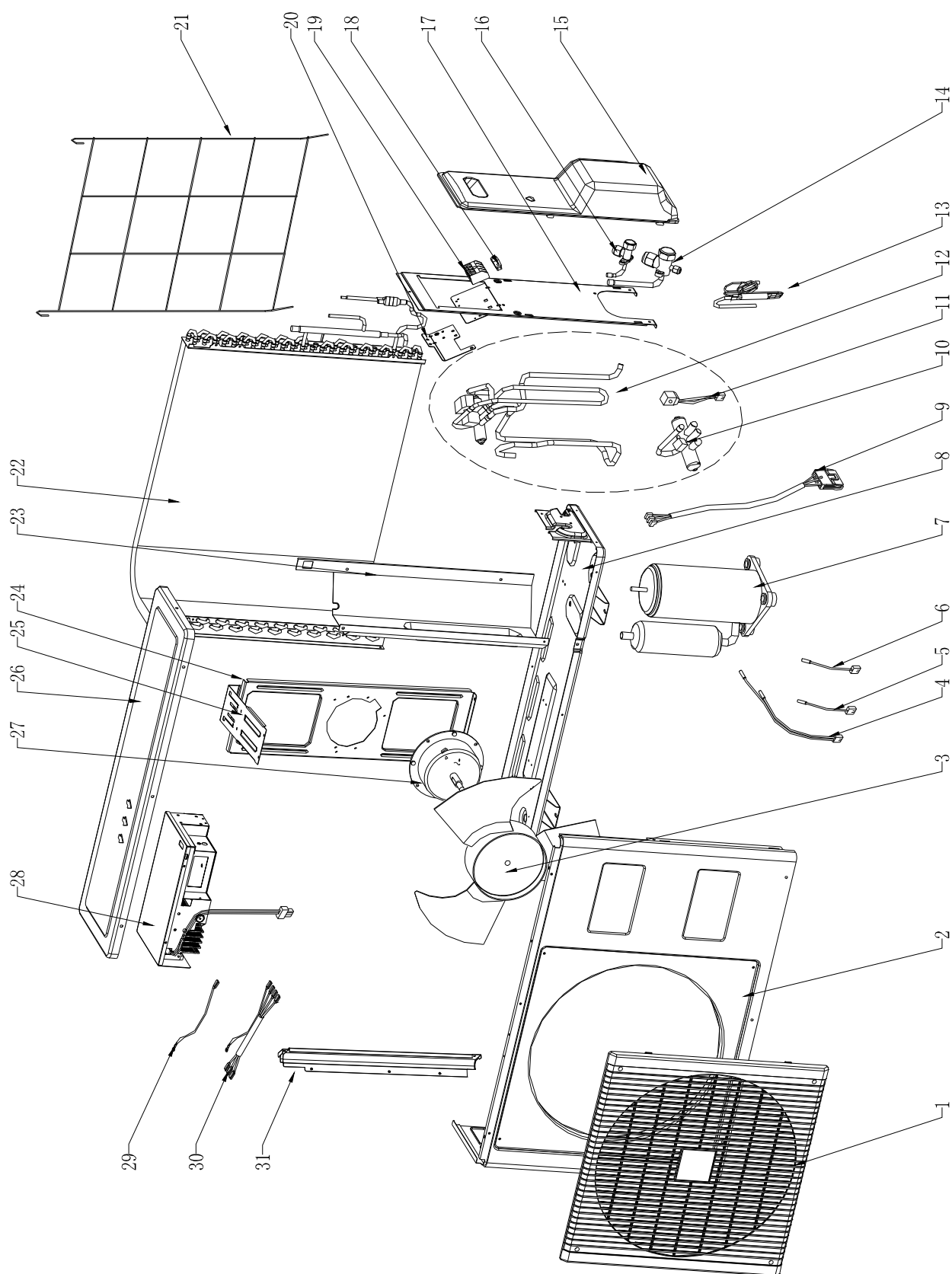
| No. | Part No.  | Name  | Quan. |
|-----|-----------|---|-------|
| 1   | 4522551   | Grille A of GCN                                 | 1     |
| 2   | 4523441   | Front panel A Painting assy                     | 1     |
| 3   | 4519251   | Axial Fan OD=400                                | 1     |
| 4   | 453238900 | Sensor/OAT                                      | 1     |
| 5   | 4526775   | Compressor top thermistor(CTT)                  | 1     |
| 6   | 4526776   | Outdoor coil thermistor(OCT)                    | 1     |
| 7   | 453170100 | Compressor Assy. MATSUSHIBA 5RS092XDJ01         | 1     |
| 8   | 453052500 | PAINTING BASE ASSY.                             | 1     |
| 9   | 4526221   | Compressor wire                                 | 1     |
| 10  | 4518951   | 4-W valve SHF-4H for R410A                      | 1     |
| 11  | 4522509   | 4-Way valve coil                                | 1     |
| 12  | 453058600 | 4way valve soldering assy FOR DCR 7             | 1     |
| 13  | 453026600 | Electronic expansion valve ZDPF(L)-1.5C-01      | 1     |
| 14  | 4526216   | EEV COIL QA(L)12-MD-02                          | 1     |
| 15  | 453047000 | Low pressure stop valve for R410A               | 1     |
| 16  | 4516857   | BIG SIDE COVER                                  | 1     |
| 17  | 453046900 | High pressure stop valve for R410A              | 1     |
| 18  | 464630000 | Side Plate Painting Assy.                       | 1     |
| 19  | 253046    | Clip set PVC                                    | 1     |
| 20  | 4519188   | 4 poles terminal block                          | 1     |
| 21  | 4516156   | Rear panel Painting assy                        | 1     |
| 22  | 453230000 | Connect Plate                                   | 1     |
| 23  | 453048000 | Condenser assy. (OD7.94x1row) for DCR 7         | 1     |
| 24  | 453052700 | PATITION  | 1     |
| 25  | 323156    | Motor support assy                              | 1     |
| 26  | 4516158   | Cover panel Painting assy                       | 1     |
| 27  | 453031300 | Metal motor 20W                                 | 1     |
| 28  | 453031000 | DC INVERTER CONTROLLER EHK:906-106-00           | 1     |
| 29  | 452841100 | Earth wire                                      | 1     |
| 30  | 453129300 | Wire UL1007 16AWG/Controller with 250 connector | 1     |

## 17.6 Outdoor Unit: GC 9 RC DCI

| No. | Part No.  | Name  | Quan. |
|-----|-----------|---|-------|
| 1   | 4522551   | Grille A of GCN                                 | 1     |
| 2   | 4523441   | Front panel A Painting assy                     | 1     |
| 3   | 4519251   | Axial Fan OD=400                                | 1     |
| 4   | 453238900 | Sensor/OAT                                      | 1     |
| 5   | 4526775   | Compressor top thermistor(CTT)                  | 1     |
| 6   | 4526776   | Outdoor coil thermistor(OCT)                    | 1     |
| 7   | 453170100 | Compressor: Rotary, Panasonic 5RS092XDJ01       | 1     |
| 8   | 453052500 | PAINTING BASE ASSY.                             | 1     |
| 9   | 4526221   | Compressor wire                                 | 1     |
| 10  | 4518951   | 4-W valve SHF-4H for R410A                      | 1     |
| 11  | 4522509   | 4-Way valve coil                                | 1     |
| 12  | 453058700 | 4way valve soldering assy FOR DCR 9             | 1     |
| 13  | 453026600 | Electronic expansion valve ZDPF(L)-1.5C-01      | 1     |
| 14  | 4526216   | EEV COIL QA(L)12-MD-02                          | 1     |
| 15  | 453047000 | Low pressure stop valve for R410A               | 1     |
| 16  | 4516857   | BIG SIDE COVER                                  | 1     |
| 17  | 453046900 | High pressure stop valve for R410A              | 1     |
| 18  | 464630000 | Side Plate Painting Assy.                       | 1     |
| 19  | 253046    | Clip set PVC                                    | 1     |
| 20  | 4519188   | 4 poles terminal block                          | 1     |
| 21  | 4516156   | Rear panel Painting assy                        | 1     |
| 22  | 453230000 | Connect Plate                                   | 1     |
| 23  | 453048200 | Condenser assy. (OD7x2rows) for DCR 9           | 1     |
| 24  | 453052700 | PATITION  | 1     |
| 25  | 323156    | Motor support assy                              | 1     |
| 26  | 4516158   | Cover panel Painting assy                       | 1     |
| 27  | 453031300 | Metal motor 20W                                 | 1     |
| 28  | 453031000 | DC INVERTER CONTROLLER EHK:906-106-00           | 1     |
| 29  | 452841100 | Earth wire                                      | 1     |
| 30  | 453129300 | Wire UL1007 16AWG/Controller with 250 connector | 1     |

## 17.7 Outdoor Unit: GC 12 RC DCI

| No. | Part No.  | Name  | Quan. |
|-----|-----------|---|-------|
| 1   | 4522551   | Grille A of GCN                                 | 1     |
| 2   | 4523441   | Front panel A Painting assy                     | 1     |
| 3   | 4519251   | Axial Fan OD=400                                | 1     |
| 4   | 453238900 | Sensor/OAT                                      | 1     |
| 5   | 4526775   | Compressor top thermistor(CTT)                  | 1     |
| 6   | 4526776   | Outdoor coil thermistor(OCT)                    | 1     |
| 7   | 4526204   | Compressor Assy. Rotary, Panasonic 5RS102XAB01  | 1     |
| 8   | 453052500 | PAINTING BASE ASSY.                             | 1     |
| 9   | 4526221   | Compressor wire                                 | 1     |
| 10  | 4518951   | 4-W valve SHF-4H for R410A                      | 1     |
| 11  | 4522509   | 4-Way valve coil                                | 1     |
| 12  | 453058800 | 4way valve soldering assy FOR DCR 35            | 1     |
| 13  | 453026600 | Electronic expansion valve ZDPF(L)-1.5C-01      | 1     |
| 14  | 4526216   | EEV COIL QA(L)12-MD-02                          | 1     |
| 15  | 453047000 | Low pressure stop valve for R410A               | 1     |
| 16  | 4516857   | BIG SIDE COVER                                  | 1     |
| 17  | 453046900 | High pressure stop valve for R410A              | 1     |
| 18  | 464630000 | Side Plate Painting Assy.                       | 1     |
| 19  | 253046    | Clip set PVC                                    | 1     |
| 20  | 4519188   | 4 poles terminal block                          | 1     |
| 21  | 4516156   | Rear panel Painting assy                        | 1     |
| 22  | 453230000 | Connect Plate                                   | 1     |
| 23  | 453048400 | Condenser assy. (OD7.94x2rows) for DCR 35       | 1     |
| 24  | 453052700 | PATITION  | 1     |
| 25  | 323156    | Motor support assy                              | 1     |
| 26  | 4516158   | Cover panel Painting assy                       | 1     |
| 27  | 453031200 | Metal motor 27W                                 | 1     |
| 28  | 453031000 | DC INVERTER CONTROLLER EHK:906-106-00           | 1     |
| 29  | 452841100 | Earth wire                                      | 1     |
| 30  | 453129300 | Wire UL1007 16AWG/Controller with 250 connector | 1     |

**17.8 Outdoor Unit: GCD009 / GCD012**

## 17.9 Outdoor Unit: GCD009

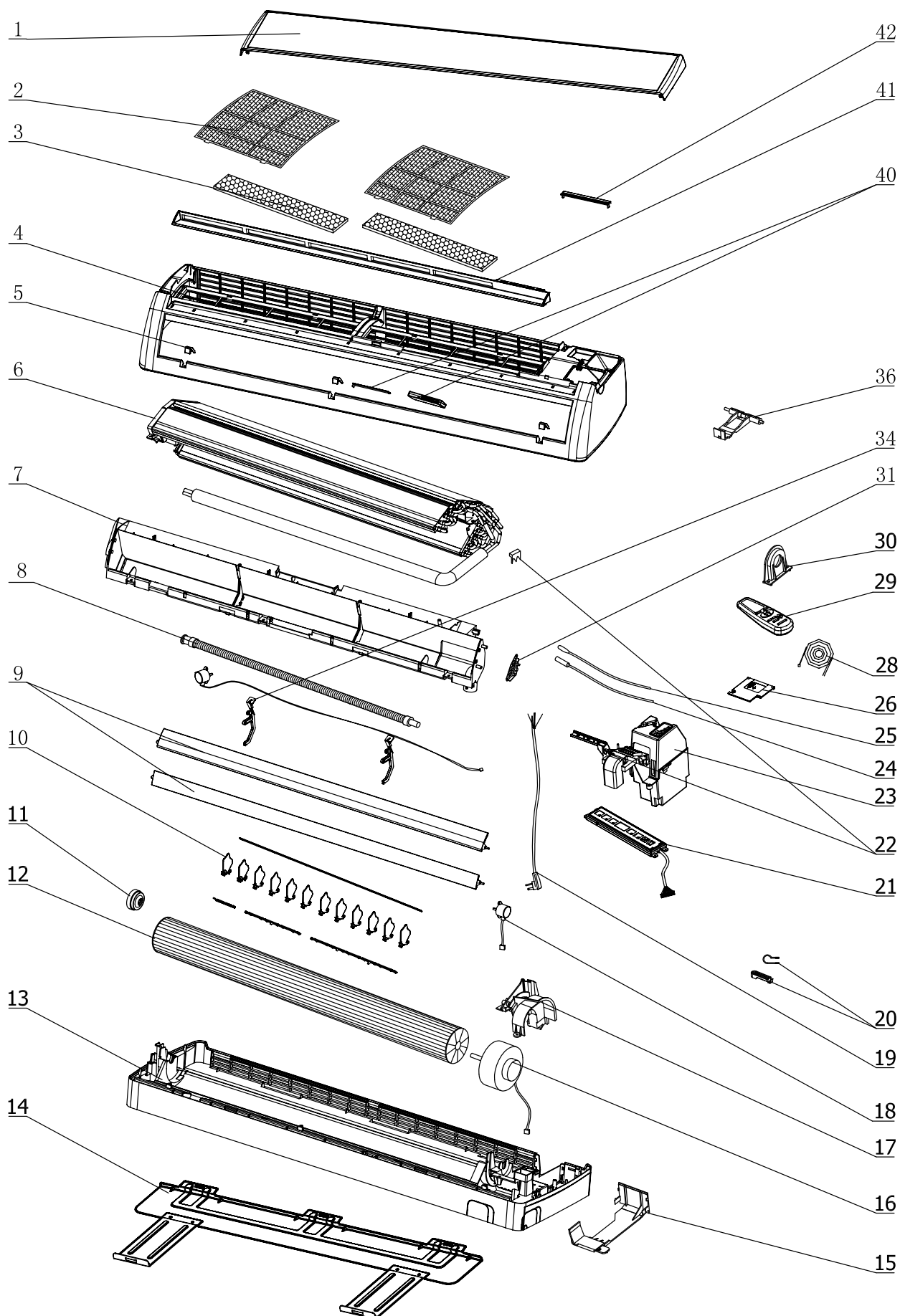
| No. | Part No.   | Name  | Quan. |
|-----|------------|---|-------|
| 1   | 4522551    | Grille A of GCN                                 | 1     |
| 2   | 4523441    | Front panel A Painting assy                     | 1     |
| 3   | 4519251    | Axial Fan OD=400                                | 1     |
| 4   | 467400040  | Sensor/OAT & OMT                                | 1     |
| 5   | 467400200  | Compressor top thermistor(CTT)                  | 1     |
| 6   | 467400023  | Outdoor coil thermistor(OCT)                    | 1     |
| 7   | 460000032R | Compressor Assy. Toshiba DA89X1C-20FZ3          | 1     |
| 8   | 453052500  | PAINTING BASE ASSY.                             | 1     |
| 9   | 467000001  | Compressor Power Cord                           | 1     |
| 10  | 4518951    | 4-W valve SHF-4H for R410A                      | 1     |
| 11  | 4522509    | 4-Way valve coil                                | 1     |
| 12  | 461600067  | 4-way valve soldering assy FOR DCR 22/25 Z      | 1     |
| 13  | 463600050  | Capillary Assy FOR DCR 22/25 Z                  | 1     |
| 14  | 461010004  | Gas Valve 3/8" R410A                            | 1     |
| 15  | 4516857    | BIG SIDE COVER                                  | 1     |
| 16  | 461000004  | Liquid Valve 1/4" R410A                         | 1     |
| 17  | 464630000  | Side Plate Painting Assy.                       | 1     |
| 18  | 204107     | Clip set PVC                                    | 1     |
| 19  | 4519188    | 4 poles terminal block                          | 1     |
| 20  | 453230000  | Connect Plate                                   | 1     |
| 21  | 464800007  | Back Guard Net Painting Assy./GCZ               | 1     |
| 22  | 462300092  | Condenser Assy.FOR DCR 22/25 Z R410A            | 1     |
| 23  | 453052700  | PATITION  | 1     |
| 24  | 453085600  | Motor Support                                   | 1     |
| 25  | 453085800  | Connect Plate/Motor Support                     | 1     |
| 26  | 4516158    | Cover panel Painting assy                       | 1     |
| 27  | 453031200R | Metal motor 27W                                 | 1     |
| 28  | 467300225R | Controller / DCR 1.6KW OMT                      | 1     |
| 29  | 452841100  | Earth wire                                      | 1     |
| 30  | 453129300  | Wire UL1007 16AWG/Controller with 250 connector | 1     |
| 31  | 453085500  | Rear Plate/Left                                 | 1     |



### 17.10 Outdoor Unit: GCD012

| No. | Part No.   | Name  | Quan. |
|-----|------------|---|-------|
| 1   | 4522551    | Grille A of GCN                                 | 1     |
| 2   | 4523441    | Front panel A Painting assy                     | 1     |
| 3   | 4519251    | Axial Fan OD=400                                | 1     |
| 4   | 467400040  | Sensor/OAT & OMT                                | 1     |
| 5   | 467400200  | Compressor top thermistor(CTT)                  | 1     |
| 6   | 467400023  | Outdoor coil thermistor(OCT)                    | 1     |
| 7   | 460000033R | Compressor Assy. Toshiba DA108X1C-20FZ3         | 1     |
| 8   | 453052500  | PAINTING BASE ASSY.                             | 1     |
| 9   | 467000001  | Compressor Power Cord                           | 1     |
| 10  | 4518951    | 4-W valve SHF-4H for R410A                      | 1     |
| 11  | 4522509    | 4-Way valve coil                                | 1     |
| 12  | 461600068  | 4-way valve soldering assy FOR DCR 35 Z         | 1     |
| 13  | 463600051  | Capillary Assy FOR DCR 35 Z                     | 1     |
| 14  | 461010004  | Gas Valve 3/8" R410A                            | 1     |
| 15  | 4516857    | BIG SIDE COVER                                  | 1     |
| 16  | 461000004  | Liquid Valve 1/4" R410A                         | 1     |
| 17  | 464630000  | Side Plate Painting Assy.                       | 1     |
| 18  | 204107     | Clip set PVC                                    | 1     |
| 19  | 4519188    | 4 poles terminal block                          | 1     |
| 20  | 453230000  | Connect Plate                                   | 1     |
| 21  | 464800007  | Back Guard Net Painting Assy./GCZ               | 1     |
| 22  | 462300093  | Condenser Assy.FOR DCR 35 Z R410A               | 1     |
| 23  | 453052700  | PATITION  | 1     |
| 24  | 453085600  | Motor Support                                   | 1     |
| 25  | 453085800  | Connect Plate/Motor Support                     | 1     |
| 26  | 4516158    | Cover panel Painting assy                       | 1     |
| 27  | 453031200R | Metal motor 27W                                 | 1     |
| 28  | 467300225R | Controller / DCR 1.6KW OMT                      | 1     |
| 29  | 452841100  | Earth wire                                      | 1     |
| 30  | 453129300  | Wire UL1007 16AWG/Controller with 250 connector | 1     |
| 31  | 453085500  | Rear Plate/Left                                 | 1     |

**17.11 Indoor Unit: HAD018 / HAD022 / HAD024**



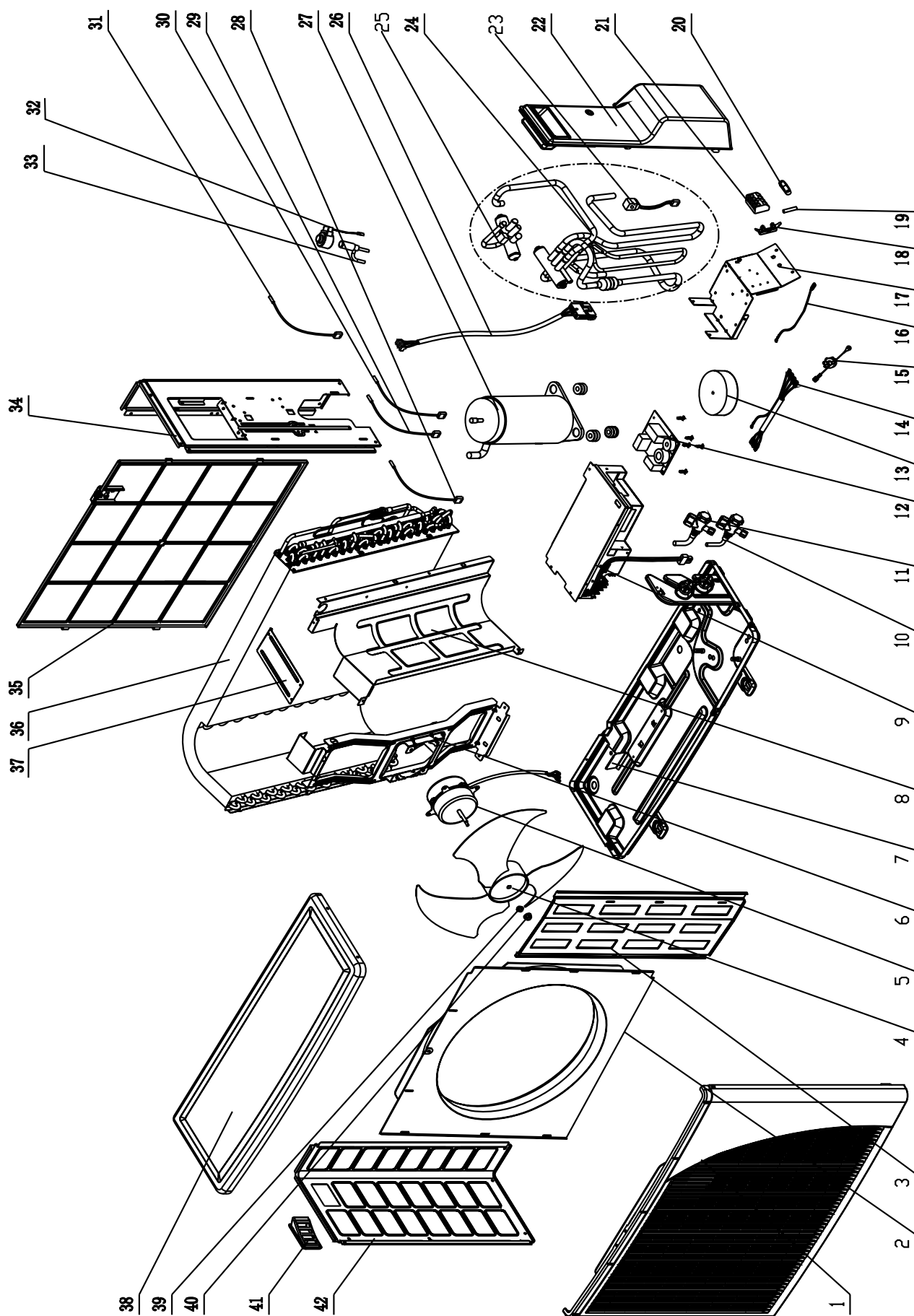
## 17.12 Indoor Unit: HAD018 / HAD022

| No. | Part No.   | Item Description   | Quantity |
|-----|------------|--|----------|
| 1   | 465720378  | Front panel Assy./Black/Airwell                          | 1        |
| 1   | 465720379  | Front panel Assy./Black/electra                          | 1        |
| 1   | 465720380  | Front panel Assy./Black/electra Inverter                 | 1        |
| 1   | 465720381  | Front panel Assy./Black/Johnson                          | 1        |
| 1   | 465720382  | Front panel Assy./Silver-white/Airwell                   | 1        |
| 1   | 465720383  | Front panel Assy./Silver-white/electra                   | 1        |
| 1   | 465720384  | Front panel Assy./Silver-white/electra Inverter          | 1        |
| 1   | 465720385  | Front panel Assy./Silver-white/Johnson                   | 1        |
| 2   | 452919800  | Filter   | 2        |
| 3   | 470500012  | Nanometer Photocatalysis Deodorant Filter                | 1        |
| 3   | 470500015  | Biological Sterilization Filter                          | 1        |
| 4   | 465720388  | Front Frame Assy.  | 1        |
| 5   | 465340085  | Screw Cover/Glossy                                       | 3        |
| 6   | 453134600  | Evaporator Assy.   | 1        |
| 7   | 465800111  | Air Outlet Frame Assy.                                   | 1        |
| 8   | 465210009  | Drain Pipe for Europe                                    | 1        |
| 9   | 465160023  | Horizontal flap A  | 1        |
| 9   | 465160024  | Horizontal flap B  | 1        |
| 10  | 465160016  | Vertical Flap A  | 12       |
| 10  | 465160017  | Vertical Flap B  | 2        |
| 11  | 4518662    | Bearing assy fan   | 1        |
| 12  | 453024900  | Impeller fan   | 1        |
| 13  | 465700011  | Unit Housing Assy  | 1        |
| 14  | 452920100  | Mount bracket  | 1        |
| 15  | 465320017  | Connect Plate  | 1        |
| 16  | 453024500R | PG Motor   | 1        |
| 17  | 452918800  | Cover/motor  | 1        |
| 18  | 453050200  | STEP MOTOR A   | 1        |
| 18  | 453050300  | STEP MOTOR B   | 1        |
| 19  | 455013404R | Power Cord/3G/2.5/2100                                   | 1        |
| 19  | 455013707R | Power Cord Without Plug/3G/2.5/2100                      | 1        |
| 20  | 453232000  | Clip /Power cord   | 1        |
| 21  | 467300228R | Display Board / HAD                                      | 1        |
| 22  | 452919100  | Support/sensor   | 1        |
| 22  | 4516263    | SENSOR BASE  | 1        |
| 23  | 467300258R | Controller / DCI IDU HAD 18                              | 1        |
| 24  | 467400053  | ICT Indoor Coil Temperature (RT2) sensor                 | 1        |
| 25  | 467400025  | Indoor Air Inlet Temperature Sensor                      | 1        |
| 26  | 465340051  | Terminal Cover   | 1        |
| 29  | 467240025  | Remote controller Assy.with batteries. RC-7i-1(RAL9003AW | 1        |
| 29  | 467240026  | Remote controller Assy.with batteries. RC-7i-1 (BLACK)   | 1        |
| 30  | 4518651    | Cover Side Motor   | 1        |
| 31  | 453057900  | Gear BOX ASSY  | 1        |
| 34  | 464250070  | Support/Horizontal Flap                                  | 2        |
| 36  | 465320033  | TUBE LOCK  | 1        |
| 40  | 467480009  | Ionizer/Bi-Polar   | 1        |
| 40  | 465360039  | Support/Bi Polar Ionizer                                 | 1        |
| 40  | 465340049  | Cover/Bi Polar Ionizer                                   | 1        |
| 41  | 465160008  | Air Inlet Frame A Assy                                   | 1        |
| 42  | 465340045  | Cover/Front Frame  | 2        |

## 17.13 Indoor Unit: HAD024

| No. | Part No.   | Item Description   | Quantity |
|-----|------------|--|----------|
| 1   | 465720378  | Front panel Assy./Black/Airwell                          | 1        |
| 1   | 465720379  | Front panel Assy./Black/electra                          | 1        |
| 1   | 465720380  | Front panel Assy./Black/electra Inverter                 | 1        |
| 1   | 465720381  | Front panel Assy./Black/Johnson                          | 1        |
| 1   | 465720382  | Front panel Assy./Silver-white/Airwell                   | 1        |
| 1   | 465720383  | Front panel Assy./Silver-white/electra                   | 1        |
| 1   | 465720384  | Front panel Assy./Silver-white/electra Inverter          | 1        |
| 1   | 465720385  | Front panel Assy./Silver-white/Johnson                   | 1        |
| 2   | 452919800  | Filter   | 2        |
| 3   | 470500012  | Nanometer Photocatalysis Deodorant Filter                | 1        |
| 3   | 470500015  | Biological Sterilization Filter                          | 1        |
| 4   | 465720388  | Front Frame Assy.  | 1        |
| 5   | 465340085  | Screw Cover  | 3        |
| 6   | 453260400  | Evaporator Assy  | 1        |
| 7   | 465800111  | Air Outlet Frame Assy.                                   | 1        |
| 8   | 465210009  | Drain Pipe for Europe                                    | 1        |
| 9   | 465160023  | Horizontal flap A  | 1        |
| 9   | 465160024  | Horizontal flap B  | 1        |
| 10  | 465160016  | Vertical Flap A  | 12       |
| 10  | 465160017  | Vertical Flap B  | 2        |
| 11  | 4518662    | Bearing assy fan   | 1        |
| 12  | 453024900  | Impeller fan   | 1        |
| 13  | 465700011  | Unit Housing Assy.                                       | 1        |
| 14  | 452920100  | Mount bracket  | 1        |
| 15  | 465320017  | Connect Plate/Unit housing                               | 1        |
| 16  | 453206800R | DC Motor   | 1        |
| 17  | 452918800  | Cover/motor  | 1        |
| 18  | 453050200  | STEP MOTOR A   | 1        |
| 18  | 453050300  | STEP MOTOR B   | 1        |
| 20  | 453232000  | Clip /Power cord   | 1        |
| 21  | 467300228R | Display Board  | 1        |
| 22  | 452919100  | Support/sensor   | 1        |
| 22  | 4516263    | SENSOR BASE  | 1        |
| 23  | 467300259R | Controller   | 1        |
| 24  | 467400053  | ICT Indoor Coil Temperature (RT2) sensor                 | 1        |
| 25  | 467400025  | Indoor Air Inlet Temperature Sensor                      | 1        |
| 26  | 465340051  | Terminal Cover   | 1        |
| 29  | 467240025  | Remote controller Assy.with batteries. RC-7i-1(RAL9003AW | 1        |
| 29  | 467240026  | Remote controller Assy.with batteries. RC-7i-1 (BLACK)   | 1        |
| 30  | 4518651    | Cover Side Motor   | 1        |
| 31  | 453057900  | Gear BOX ASSY  | 1        |
| 34  | 464250070  | Support/Horizontal Flap                                  | 2        |
| 36  | 465320033  | TUBE LOCK  | 1        |
| 40  | 467480009  | Ionizer/Bi-Polar   | 1        |
| 40  | 465360039  | Support/Bi Polar Ionizer                                 | 1        |
| 40  | 465340049  | Cover/Bi Polar Ionizer                                   | 1        |
| 41  | 465160008  | Air Inlet Frame A Assy                                   | 1        |
| 42  | 465340045  | Cover/Front Frame  | 2        |

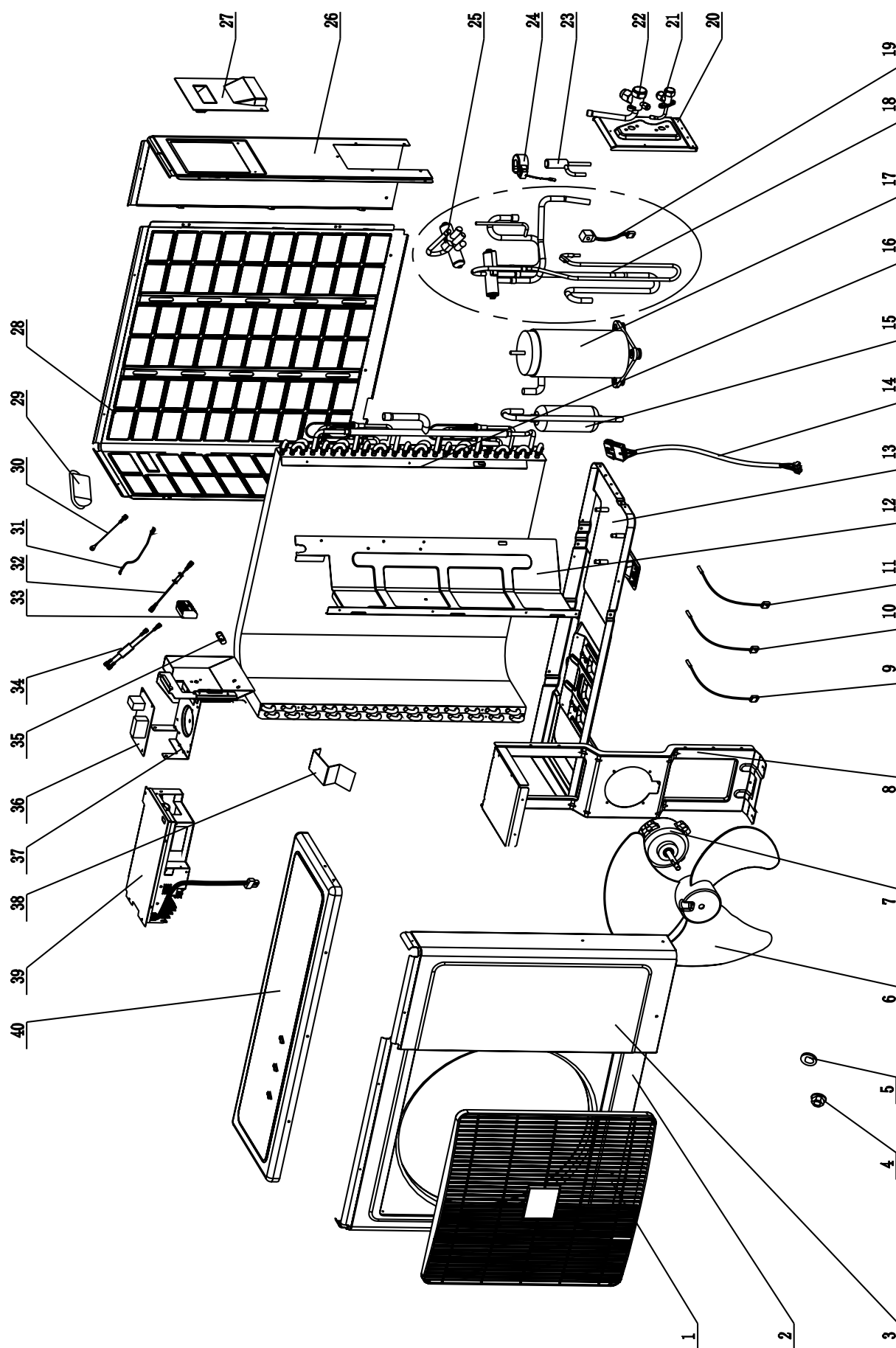
## 17.14 Outdoor Unit: GC 18 DCI



## 17.15 Outdoor Unit: GC 18 DCI

| No. | Item       | Description                                   | Quantity |
|-----|------------|---|----------|
| 1   | 433218     | Front Panel A                                 | 1        |
| 2   | 4526340    | Air inlet ring                                | 1        |
| 3   | 464860054  | Painting Insulation Plate Assy                | 1        |
| 4   | 4526476    | Axial fan                                     | 1        |
| 5   | 452889600R | DC Resin Motor                                | 1        |
| 6   | 4526457    | Motor Support                                 | 1        |
| 7   | 4527363    | Base Painting Assy.                           | 1        |
| 8   | 4526456    | Partition                                     | 1        |
| 9   | 467300025R | Controller/Outdoor Unit DCI 2.8kW 50(English) | 1        |
| 10  | 463300506  | Standard Valve Connect Pipe/Gas Valve         | 1        |
| 10  | 461010005  | Gas Valve 1/2 R410A "                         | 1        |
| 11  | 463300560  | Connect Pipe/Standard Valve to Liquid Valve   | 1        |
| 11  | 461000004  | Liquid Valve 1/4 R410A "                      | 1        |
| 12  | 467300024R | Filter Board                                  | 1        |
| 13  | 4526396R   | Choke assy.                                   | 1        |
| 14  | 4526223    | AC-IN wire                                    | 1        |
| 15  | 455015202  | ground wire                                   | 1        |
| 17  | 4526300    | Therminal sheet                               | 1        |
| 20  | 204107     | Cable clip Nylon                              | 1        |
| 21  | 4519188    | 4 poles terminal block                        | 1        |
| 22  | 465340080  | Valve Cover                                   | 1        |
| 23  | 4522509    | 4-Way valve coil                              | 1        |
| 24  | 461600060  | 4-Way Valve Assy.                             | 1        |
| 25  | 4518952    | 4-W valve                                     | 1        |
| 26  | 4526221    | Compressor wire                               | 1        |
| 27  | 4523446    | Scroll DC compressor assy.                    | 1        |
| 28  | 467400055  | Compressor Top Temperature Sensor             | 1        |
| 29  | 467400026  | Outdoor Air Temperature Sensor                | 1        |
| 30  | 467400056  | Outdoor Coil Temperature Sensor               | 1        |
| 32  | 4526216    | EEV COIL QA(L)12-MD-02                        | 1        |
| 33  | 4526215    | Electronic expansion valve ZDPF(L)-1.6C-01-RK | 1        |
| 34  | 4519606    | Right side panel                              | 1        |
| 35  | 433228     | Back Side Net                                 | 1        |
| 36  | 4526459    | Condensor sys. assy.                          | 1        |
| 37  | 4526298    | Bridge  | 1        |
| 38  | 4519614    | Painting Top Cover                            | 1        |
| 39  | 4526480    | Gasket for axial fan                          | 1        |
| 40  | 4519300    | Nut   | 1        |
| 41  | 433225     | Handle  | 1        |
| 42  | 4519607    | Left Side Panel Painting Plate                | 1        |

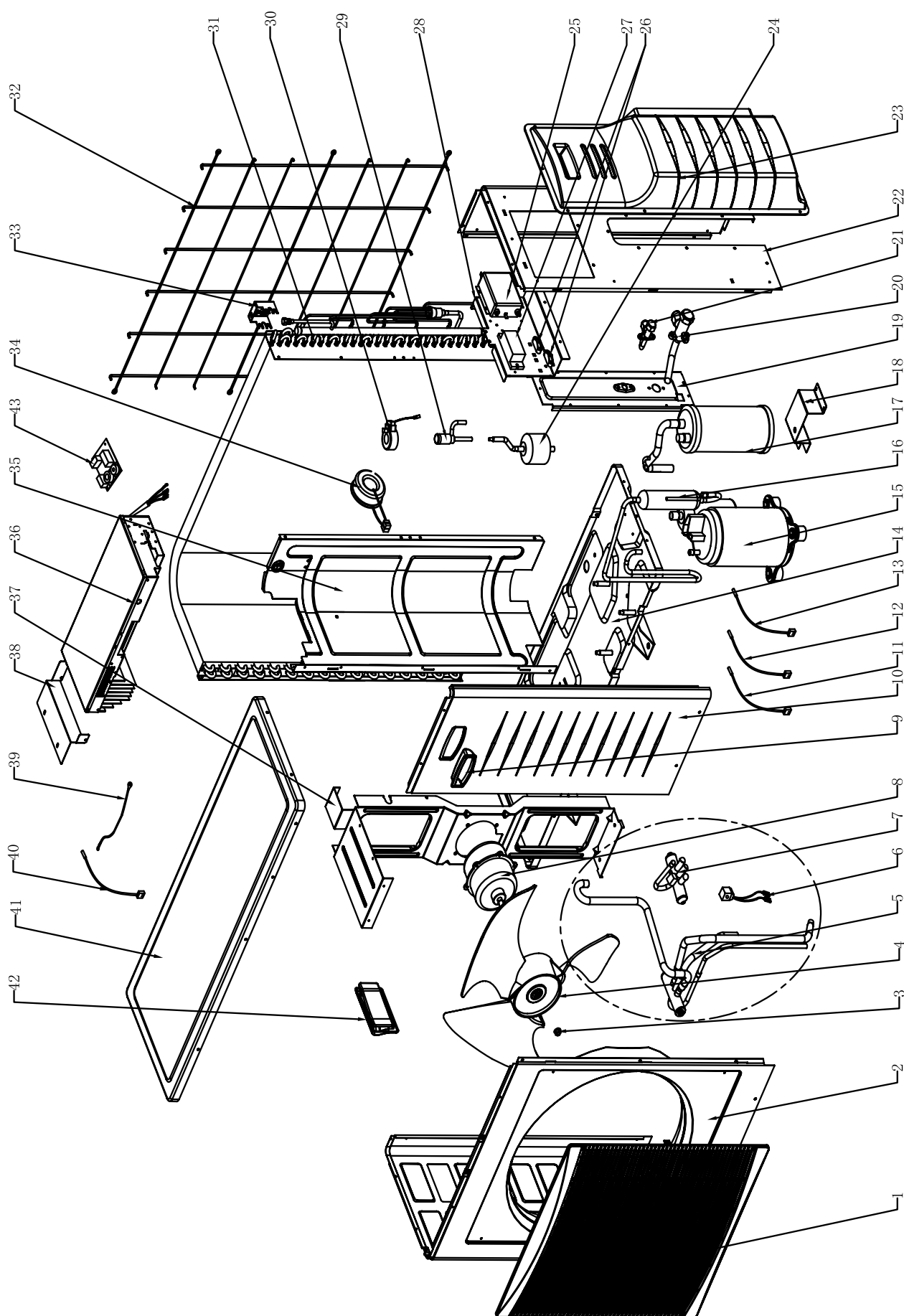
## 17.16 Outdoor Unit: GC 21 DCI



## 17.17 Outdoor Unit: GC 21 DCI

| No. | Item       | Description                                   | Quantity |
|-----|------------|---|----------|
| 1   | 4517144    | FAN COVER/GRILL A                             | 1        |
| 2   | 452795700  | PAINTED LEFT CABINET ASSY                     | 1        |
| 3   | 4521642    | Painted Right Cabinet and Isolation Assy.     | 1        |
| 4   | 4523141    | Hexagon locked nut M10                        | 1        |
| 5   | 4526841    | Cusion for fan                                | 1        |
| 6   | 4526510    | FAN   | 1        |
| 7   | 453026500R | DC Motor                                      | 1        |
| 8   | 453036400  | Motor Support                                 | 1        |
| 9   | 467400027  | OAT Outdoor Air Temperature Sensor            | 1        |
| 10  | 467400055  | Compressor Top Temperature Sensor             | 1        |
| 11  | 467400056  | Outdoor Coil Temperature Sensor               | 1        |
| 12  | 464160004  | Partition Plate                               | 1        |
| 13  | 453036100  | Base Plate Paint Assy.                        | 1        |
| 14  | 4526221    | Compressor wire                               | 1        |
| 15  | 453041900  | Liquid Accumulator Assy.                      | 1        |
| 16  | 452882900  | Condenser and distributor welding assy.       | 1        |
| 17  | 4523446    | Scroll DC compressor assy.                    | 1        |
| 18  | 461600061  | 4-Way Valve Assy.                             | 1        |
| 19  | 4522509    | 4-Way valve coil                              | 1        |
| 20  | 4516766    | PAINTED VALVE PLATE ASSY                      | 1        |
| 21  | 463300510  | Standard Valve Connect Pipe/Liquid Valve      | 1        |
| 21  | 461000004  | Liquid Valve 1/4 R410A "                      | 1        |
| 22  | 463300506  | Standard Valve Connect Pipe/Gas Valve         | 1        |
| 22  | 461010005  | Gas Valve 1/2 R410A "                         | 1        |
| 23  | 4526215    | Electronic expansion valve                    | 1        |
| 24  | 4526216    | EEV COIL                                      | 1        |
| 25  | 4518952    | 4-W valve                                     | 1        |
| 26  | 4525938    | PAINTED RIGHT-BACK CABINET ASSY               | 1        |
| 27  | 465220012  | Right Lifter                                  | 1        |
| 28  | 4517028    | PAINTED LEFT-BACK GRILL                       | 1        |
| 29  | 4516758    | SMALL HANDLE                                  | 1        |
| 30  | 455015203  | ground wire                                   | 3        |
| 31  | 455015202  | ground wire                                   | 1        |
| 32  | 453238700  | connect Wire                                  | 1        |
| 33  | 4519188    | 4 poles terminal block                        | 1        |
| 34  | 453238600  | Wire/Power Input                              | 1        |
| 35  | 204107     | Cable clip Nylon                              | 1        |
| 36  | 453048500R | EMI Filter Board                              | 1        |
| 37  | 453052900  | Therminal Plate Assy.                         | 1        |
| 38  | 4526585    | connect for motor bucket                      | 1        |
| 39  | 453030500R | Controller/Outdoor Unit DCI 2.8Kw 60 (English | 1        |
| 40  | 4516788    | PAINTED TOP COVER ASSY                        | 1        |



**17.18 Outdoor Unit: GC 24 DCI**

## 17.19 Outdoor Unit: GC 24 DCI

| No. | Item       | Description                                | Quantity |
|-----|------------|--|----------|
| 1   | 465100000  | Grill                                      | 1        |
| 2   | 4523652    | Painted Left Cabinet ASSY.                 | 1        |
| 3   | 4523758    | Nut/left                                   | 1        |
| 4   | 452960400  | Outdoor Axial Fan                          | 1        |
| 5   | 461600023  | 4-Way Valve Assy.                          | 1        |
| 6   | 4522509    | 4-Way valve coil                           | 1        |
| 7   | 4526522    | 4-WAY VALVE/R410A                          | 1        |
| 8   | 466130002R | DC Resin Motor                             | 1        |
| 9   | 4522601    | Right Handle                               | 1        |
| 10  | 4523653    | Painted Right Cabinet ASSY.                | 1        |
| 11  | 467400055  | Compressor Top Temperature Sensor          | 1        |
| 12  | 467400059  | Outdoor Coil Temperature Sensor            | 1        |
| 13  | 467400078  | Condenser Coil Temperature Sensor          | 1        |
| 14  | 452809900  | Base Plate Painting Assy.                  | 1        |
| 15  | 460080000R | Compressor Assy.                           | 1        |
| 16  | 452783600  | Oil Separator Assy.                        | 1        |
| 17  | 452783200  | Liquid-gas Separator                       | 1        |
| 18  | 453256100  | Support Painting Support Assy.             | 1        |
| 19  | 4526080    | Valve plate paint assy                     | 1        |
| 20  | 4526513    | Low Press Valve(R410A)                     | 1        |
| 21  | 4526514    | High press valve(R410A)                    | 1        |
| 22  | 4523654    | Painted Right Back Cabinet ASSY.           | 1        |
| 23  | 465340082  | Valve Cover                                | 1        |
| 24  | 4518950    | Filter Drier BFK-053S                      | 1        |
| 26  | 204107     | Cable clip Nylon                           | 2        |
| 27  | 467420003  | 7 Poles Terminal Block                     | 1        |
| 28  | 464280001  | Terminal Plate                             | 1        |
| 29  | 4526215    | Electronic expansion valve                 | 1        |
| 30  | 4526216    | EEV COIL                                   | 1        |
| 31  | 462300002  | Condenser Assy.                            | 1        |
| 32  | 453175500  | Guard Net Painting Assy.                   | 1        |
| 33  | 453083800  | Support/OAT                                | 1        |
| 34  | 4526396R   | Choke assy.901A097-30                      | 1        |
| 35  | 464730006  | Partition Plate Assy.                      | 1        |
| 36  | 467300082R | Controller/Outdoor Unit DCI 3.0KW(English) | 1        |
| 37  | 464200026  | Motor Support                              | 1        |
| 38  | 464250044  | Connect Plate/Controller                   | 1        |
| 39  | 455015203  | Ground wire                                | 3        |
| 39  | 455015401  | Ground wire                                | 2        |
| 40  | 467400027  | Outdoor Air Temperature Sensor             | 1        |
| 41  | 4523657    | Painted Top Cover ASSY                     | 1        |
| 42  | 4522600    | Left Handle                                | 1        |
| 43  | 467300114R | EMI Filter Board                           | 1        |

# APPENDIX A

## INSTALLATION AND OPERATION MANUAL

- ▶ OPERATING MANUAL HAD007/009/012/018/022/024
- ▶ INSTALLATION MANUAL HAD007/009/012/018/022/024